

January 1950

# Chemical Industries

Including **CHEMICAL SPECIALTIES**

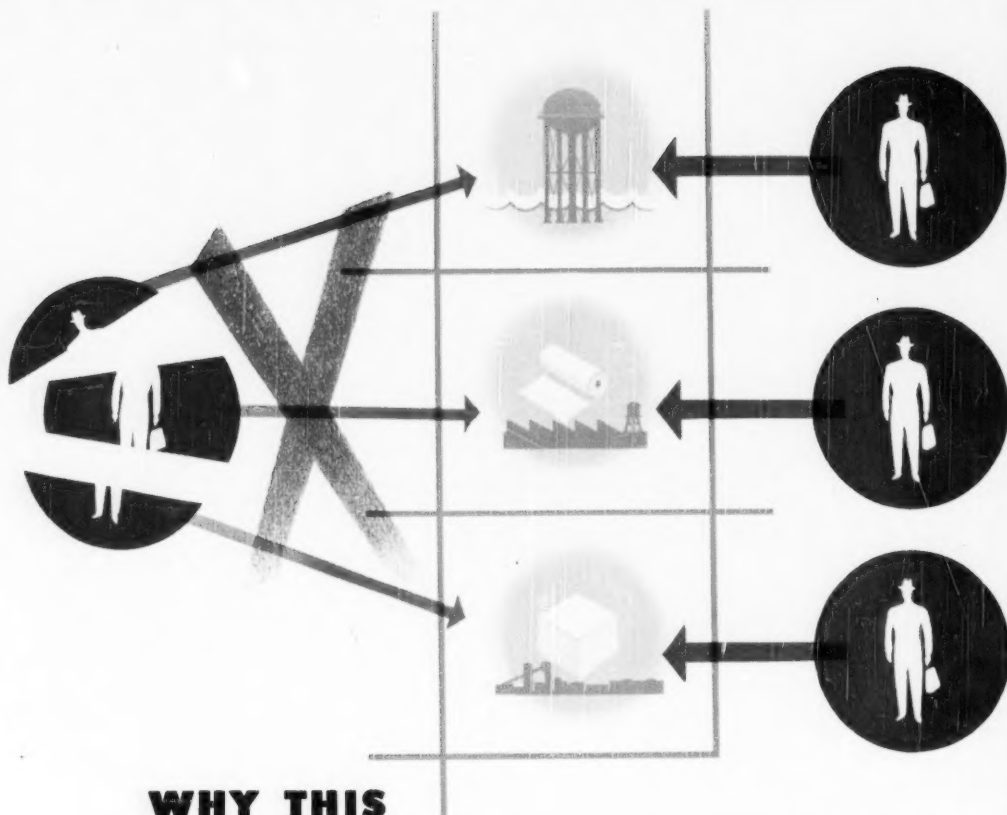
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**VARIETY OF FILTER DESIGNS  
MEETS ALL PROCESS NEEDS—p. 38**

Cover: Sampling cake from drum filter




## WHY THIS TECHNICAL SERVICE IS DIFFERENT...

**Solvay Technical Service** is organized on an "Industry-Wise" system... with Technical Service men who have spent their entire careers specializing in individual industries. The result—each man knows his industry and its problems more intimately; he can offer sound advice and practical help.

Our textile specialist is thoroughly familiar with all chemicals utilized in textile manufacturing processes. But though many of the same chemicals are used in the paper, water or other industries, our textile spe-

cialist is not called in on their problems... because *his* entire experience is concentrated on textile operations. The paper, water and other industries are covered by **SOLVAY TECHNICAL SERVICE** men who are experts in their respective fields.

When you come across a production-snagging technical situation involving alkalies or associated products in your plants... why not call **SOLVAY Industry-Wise TECHNICAL SERVICE** for help? The strictest confidence is assured. And remember—**SOLVAY** is backed by *sixty-seven* years of technical experience! 

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From these deep-water ports Mathieson is able to move economically large tonnages of heavy chemicals, new, improved fertilizers and special chemicals through low-cost shipping over inland waterways, along the coast or across the seven seas.

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Mathieson's constantly improving and expanding facilities for research, production and delivery are the result of one aim — to provide chemicals for the betterment of industry, agriculture and public health.

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CHEMICALS



Mathieson Chemical Corporation  
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BALTIMORE 3, MARYLAND

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

# Chemical Industries

Including CHEMICAL SPECIALTIES

Vol. 66, No. 1  
JANUARY 1950

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

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A MACLEAN-HUNTER publication, Horace T. Hunter, President

## JANUARY

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## Plasticizer OF THE MONTH

### DI-ISO-OCTYL PHTHALATE

Molecular Weight 390  
Boiling Range 230-239°C @ 4mm  
Specific Gravity 0.9852 ± .005 @ 20/20°C  
FFA .03 Maximum  
Total Ester 99.00 Minimum  
Color 100 APHA Maximum  
Weight 8 lbs. per gallon.

## USES

Di-iso-Octyl Phthalate is a primary plasticizer with excellent solvent power for the vinyl resins, synthetic rubbers, and many other plastic materials. It is outstanding for its permanence and for the wide variety of applications in which it can be employed.

## HARCHEM PLASTICIZERS

DICAPRYL SEBACATE  
DICAPRYL ADIPATE  
DICAPRYL PHTHALATE  
DIBUTYL SEBACATE  
DI-ISO-OCTYL SEBACATE  
DI-ISO-OCTYL ADIPATE  
DI-ISO-OCTYL PHTHALATE  
DIBENZYL SEBACATE  
DINEXYL SEBACATE  
DINEXYL ADIPATE  
DINEXYL PHTHALATE  
DIMETHYL SEBACATE  
BUTYL BENZYL SEBACATE  
CAPRYL BENZYL SEBACATE

## HARDESTY CHEMICAL CO., INC.

41 East Forty-second St., New York 17, N. Y.

## THE READER WRITES

### **The Story Behind the Oxygen Meter**

The following letter was received from Linus Pauling, inventor of the Pauling oxygen meter, in response to an inquiry from the Editor for information to be incorporated into the story "Oxygen Diviner" on page 873 of our December issue. Unfortunately, it was received too late to be included in the story, but because of the interesting light it sheds on an important wartime development we bring it to you here.—Ed.

*To the Editor of Chemical Industries:*

In connection with the story on the Beckman oxygen analyzers in your December issue, it has been suggested that you might be interested in some of the background leading to the wartime development of the Pauling oxygen meter, the instrument after which the Beckman machines were patterned.

The specific need that gave rise to the meter was the desire to determine the partial pressure of oxygen in various gases, including the atmosphere under different circumstances. Apparently both the Army and the Navy had run across circum-

stances under which this was desirable, and both branches of the Service had requested the National Defense Research Committee to attempt to provide an instrument for the rapid determination of the partial pressure of oxygen in a gas.

This was brought to my attention at a meeting held in Washington, D. C., on October 3, 1940, called by Division B of the National Defense Research Committee. It was attended by about thirty American chemists. The officers of the Division presented a list of some 25 problems that had been turned over to them by the armed services, including the problem of developing an instrument which could measure and indicate the partial pressure of oxygen in a gas.

On my way back to Pasadena by train, I thought about these problems, and the idea of using the paramagnetic properties of oxygen occurred to me. I attacked the problem by asking what properties of oxygen might serve to differentiate it from other gases. I had, a number of years earlier, investigated the magnetic properties of hemoglobin and oxyhemoglobin, and I was familiar with the paramagnetism of oxygen. It was, indeed, the knowledge that oxygen was paramagnetic

that had caused me to decide to investigate magnetic properties in connection with the study of hemoglobin. It at once became evident that a determination of magnetic susceptibility of a gas would provide information as to the partial pressure of oxygen in the gas. The usual methods of determining magnetic susceptibility require large and heavy pieces of apparatus. I thought that it might well be possible to construct an instrument in which the test body subjected to magnetic force would be suspended from a quartz fiber, and some calculations of the magnitude of the force and strength of quartz fibers indicated that this would indeed be possible.

The first meter was built by Dr. Reuben E. Wood, Research Fellow at the California Institute of Technology, immediately after the idea of the instrument was conceived. We received telegraphic permission to go ahead with the construction of the instrument and in a few days Dr. Wood had a model of the instrument operating.

The oxygen meter was put into service during the war for the determination of the amount of oxygen in the atmosphere in submarines, and to some extent for determination of oxygen available for support of respiration in airplanes. In addition, meters were used in industrial plants for the conversion of methylcyclohexane into toluene, to be used for the manufacture of TNT.

Much use of the instrument was also made for the investigation of oxygen in inspired and expired air, in connection with problems in aeromedicine. The first transportable instrument that we constructed late in 1940 was turned over to Professor Cecil Drinker of the Harvard Medical School, and was used in their aeromedical research for a number of months.

LINUS PAULING  
California Institute of Technology  
Pasadena, California.

### **Koppers Making Nonyl Phenol**

*To the Editor of Chemical Industries:*

In your discussion of new aromatics scheduled for early production by the Oronite Chemical Company in the Newsletter of your November, 1949, issue, you state:

"Like Rohm & Haas' tertiary octylphenol and Indoil's nonylphenol (the highest alkylphenol heretofore available), they will be raw materials for detergents, emulsifiers, and lube additives."

Nonyl phenol has been available from the Chemical Division, Koppers Company, Inc. on a semi-commercial scale since early in 1949 and in tankcar quantities since the middle of the year.

GILBERT THIESSEN, Technical Advisor  
Koppers Company, Inc.  
Pittsburgh 19, Pennsylvania.

## GERSTHOFEN WAXES

(FORMERLY I. G. WAXES)

... became so popular before the war that their return to this market is of great importance. These high melting, hard waxes produce lustrous films of excellent durability. They are unsurpassed in the manufacture of polishes, carbon paper and the many fields where their unique qualities may be utilized. Colors range from light yellow to dark brown.

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## POTASSIUM BICHROMATE

**OTHER NAMES:** Potassium Dichromate, Bichromate of Potash

**FORMULA:**  $K_2Cr_2O_7$

**MOLECULAR WEIGHT:** 294.21

**DESCRIPTION:** Non-hygroscopic, orange-red, prismatic crystals.

- Bulk density averages 100 lb. per cu. ft.
- $K_2Cr_2O_7$  99.9 % min.
- Chloride as Cl 0.06% max.
- Sulfate as  $SO_4$  0.01% max.

**USES:** Similar to sodium bichromate. Also the manufacture of

- corrosion inhibitive pigments, matches, pyrotechnics,
- ceramic colors and medicines. Special textile, fur and
- leather finishing, photochemical processing, blueprinting
- and proprietary compounds.

**SHIPPING CONTAINERS:**

- Bags—100 lb. net. Fibre Drums—about 400 lb. net.

## MUTUAL CHEMICAL COMPANY OF AMERICA

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January, 1950



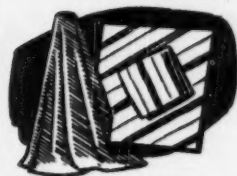
CORROSION INHIBITIVE  
PIGMENTS



MATCHES



PYROTECHNICS



TEXTILE FINISHES



FUR AND LEATHER FINISHING



PHOTO CHEMICAL SOLUTIONS

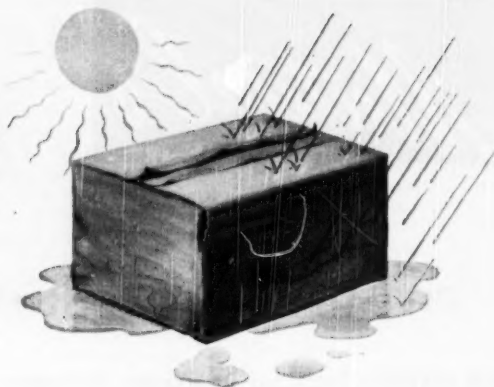


BLUEPRINTS



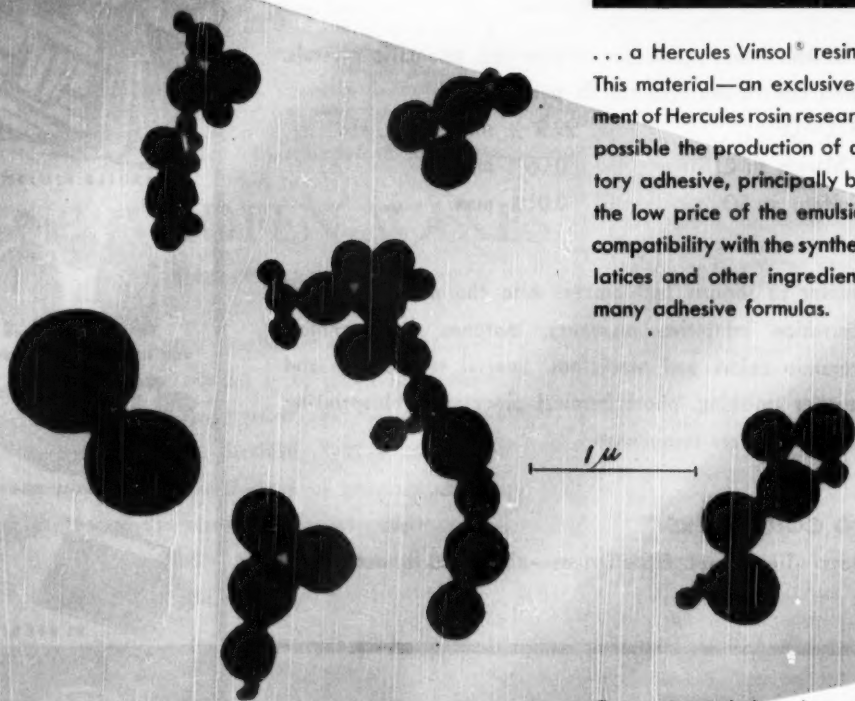
## PROBLEM...

... to produce an adhesive for paper-board shipping containers which would withstand moisture, heat, weathering, and other conditions encountered in export shipping.



## SOLUTION...

... a Hercules Vinsol<sup>®</sup> resin emulsion. This material—an exclusive development of Hercules rosin research—made possible the production of a satisfactory adhesive, principally because of the low price of the emulsion and its compatibility with the synthetic rubber latices and other ingredients used in many adhesive formulas.



Electron micrograph above shows particle size of "Vinsol" emulsion, 31,000 magnification.

**HERCULES** SYNTHETIC RESINS • CELLULOSE PRODUCTS • TERPENE CHEMICALS

**WHAT'S THE FORMULA FOR STICKINESS?** Here's how one manufacturer found out. Working with the newer synthetic rubbers, he found his answer in Hercules rosin research. The particular product for his needs, "Vinsol" resin, is available in emulsion, solution, and other forms and modifications, and offers many potentialities for other adhesive and laminating uses.

"Vinsol" is versatile as well as economical. It is used in binders for rock wool and glass wool insulating batts. It acts as an emulsifier or stabilizer in asphalt emulsions, as an air-entraining agent and plasticizer in cements. It's fine as a stiffener for paperboard, a low-cost replacement for phenolics in many uses, and suitable for certain electrical insulation applications.

Let us tell you more about "Vinsol" and the many other Hercules chemical materials that are serving industry. We would like to work with you to find new and cost-saving solutions to your processing problems.

## HERCULES POWDER COMPANY

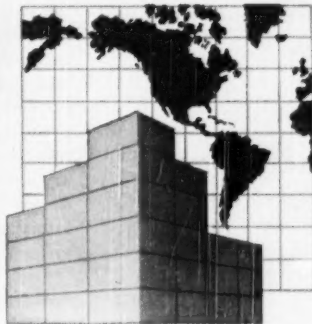
INCORPORATED

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## RESULT...

... an economically-produced, easy-to-apply adhesive which has proved successful under all conditions of overseas shipping and handling. Today, one of its applications is for the food and clothing packages shipped abroad by CARE.



"VINSOL," "CELLOLYN," "PARLON," AND "HERCOFLEX" ARE HERCULES TRADE MARKS



### Fortifier for Alkyds

If alkyd enamels are fortified with "Parlon" (Hercules chlorinated rubber), they dry faster and develop a harder film. In many formulations, "Parlon" improves chemical resistance and tint and gloss retention. These "Parlon"-fortified enamels can be air dried, force dried, or baked.

### Whiter Baking Whites

Interested in making better white baking enamels? Cellolyn® 302 is a synthetic resin specially developed for the job. When used with amine formaldehyde resins, it offers an outstanding combination of good color stability and gloss even at high oven temperatures. It is also valuable in pale or clear nitrocellulose lacquers, where it contributes good initial color and excellent color retention.

### New Vinyl Plasticizer

A new vinyl resin plasticizer with important properties, "Hercoflex" 150 (octyl decyl phthalate), is now commercially available in limited quantities. "Hercoflex" 150 is manufactured from a blend of straight chain alcohols specifically chosen to yield distinctly superior low-temperature performance coupled with unusually low volatility. It is available at no premium in price over other widely used phthalate plasticizers for vinyls.

### Secondary Recovery First

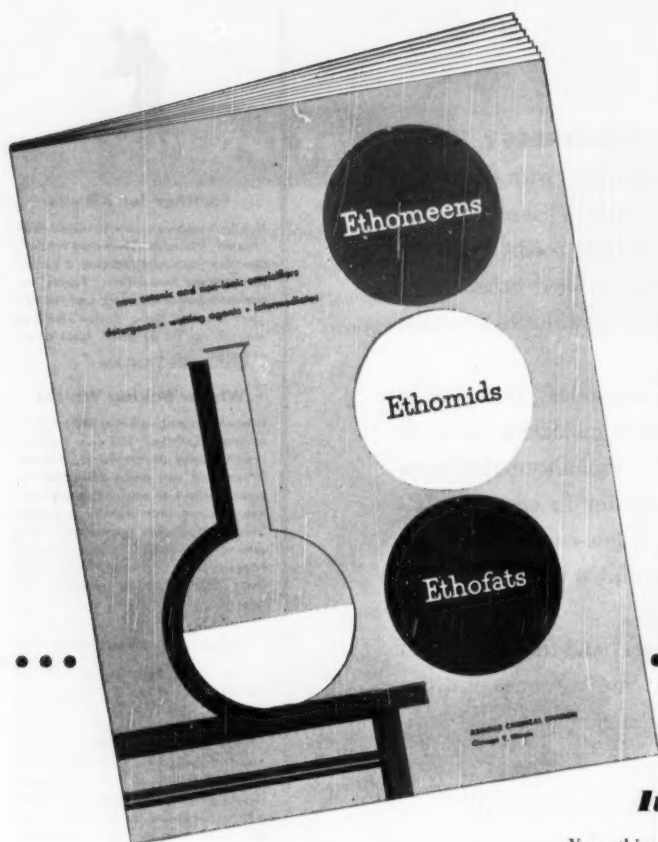
Of particular interest to secondary recovery oil-well operators is Hercules Rosin Amine D Acetate. Known as "RADA," this surface-active, water-soluble, organic amine salt is being used successfully as a corrosion inhibitor and to control bacteria in water-flooding systems.

### Self-extinguishing Thermoplastic

A heat- and flame-resistant cellulose acetate molding material is now on the market. The first thermoplastic of its type, this new material offers all the features of regular cellulose acetate: toughness, rich color, light weight, good electrical insulation, and dimensional stability—plus the important advantage of being a truly self-extinguishing material which can be injection molded. It is being used successfully for many Underwriters'-approved electrical products.

ROSIN AND ROSIN DERIVATIVES • CHLORINATED PRODUCTS • AND OTHER CHEMICAL MATERIALS FOR INDUSTRY

GC50-1



## Prescribed reading for research chemists

### *It's available free!*

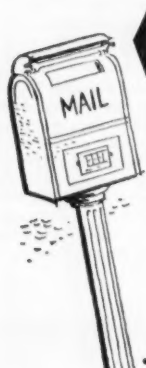
Yes, this new, informative 32-page technical book on the Ethomeens, Ethomids and Ethofats will aid many research chemists in their work. It describes the characteristics, properties and reactions of these ethylene oxide derivatives of fatty amines, fatty amides and fatty acids, plus their known and indicated uses. See the Table of Contents at left.

To date, the Etho-chemicals have proven themselves particularly valuable as emulsifiers, wetting agents; spreading agents for DDT oils; low-sudsing liquid or dry detergents for laundry, dishwashing, dairy and food plant equipment; shampoos, waterless hand creams, floor wax emulsions, soluble oils, water emulsion paints, etc. But this only skims the surface of their industrial possibilities—especially considering that some forty-four basic products (covering a wide range of solubilities) can be produced in commercial properties.

FREE samples of the Etho-chemicals are available upon request. The Armour Technical Service Department is ready to assist you with your problems.

#### Table of contents includes:

Surface Active Agents . . . Ethomeens vs. Ethomids vs. Ethofats . . . Explanation of Anionic, Non-Ionic, Cationic . . . Chemical Properties of Etho-Chemicals . . . Composition of Etho-Chemicals . . . Surface Tension Lowering . . . Wetting Action . . . Solubility Charts (showing solubility of Etho-Chemicals in Stoddard Solvent, Benzene, Carbon Tetrachloride, Dioxane, Acetone, Isopropanol, Water) . . . Surface Activity in Acid or Alkaline Solutions . . . Emulsification Coupling Agents . . . Industrial Applications of Etho-Chemicals (Formulas are suggested for many specific applications).



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# U.S.I. CHEMICAL NEWS

January ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1950

## Nutrition Expert Gives Recent APF Developments

Ingredients of animal and marine origin can be partially replaced by commercial APF supplements in animal feeds, stated Dr. H. R. Bird of the U. S. Department of Agriculture at a recent midwestern animal nutrition conference. Speaking conservatively he advised that high energy broiler rations should contain a minimum of 4% fish meal or 8% meat meal; starter or breeder mash may contain as low as 2% fish meal or 4% meat meal provided an APF supplement is used to furnish the rest of the essential APF complex. Dr. Bird mentioned that there is evidence of at least two additional factors, other than vitamin B<sub>12</sub>, which go to make up the important animal protein factor.

Practical experiments with U.S.I. Animal Protein Factor Supplement have shown improved growth with this primary fermentation product as compared with B<sub>12</sub> concentrates mixed in the feed. There is evidence that along with guaranteed amounts of vitamin B<sub>12</sub>, U.S.I.'s APF Supplement contains appreciable amounts of unidentified factors that are essential for optimum growth.

## Chemicals Used to Prevent Formation of Histamine

A new approach to the allergy problem is being taken in research with certain chemicals related to vitamin P—*d*-catechin and epicatechin. These chemicals help prevent histamine formation in the body, rather than interfering with its effects, as do the currently used antihistamines.

## Boating Enthusiasts Find Solox Ideal for Many Marine Uses

U.S.I. Proprietary Alcohol Solvent Is Used for Fueling Yacht Stoves, Thinning and Removing Shellac, Cleaning Glass

Among yacht-owners and others who are mariners by avocation, U.S.I.'s proprietary alcohol solvent, Solox, has rapidly acquired a reputation for being an extremely versatile product for marine use. Solox burns with a clean, colorless flame, without odor, and leaves no residue. These properties, plus its convenient packaging—in easy-to-store, easy-to-pour gallon, quart, and pint containers, as well as the conventional 54 gallon and 5 gallon drums—make Solox tops for use as fuel in marine stoves.

## Inexpensive Polio Vaccine May Come from New Method

A comparatively inexpensive process for producing a vaccine against poliomyelitis may result from a newly developed method of growing the virus on adult human tissue, in test-tubes. Previously the only known medium for culturing the virus in test-tubes was human embryonic tissue. With the new method it may prove possible to transplant the virus from the adult tissue to hens' eggs, as has been done in the past in cultivating other disease-causing viruses. Such a development might permit production of a polio vaccine in relatively large quantities.

## How to Reduce Fire Hazard

A new informative 12-page booklet, available now without charge, is designed to help industry reduce fire hazards and losses. The subject of flammable liquids particularly is covered in several sections of the booklet.

Maintenance of protective coatings has always been a problem for the boat-owner. The superior solvent action and mild, non-residual



odor of Solox have made it a favorite for cutting and thinning spirit varnish and shellac, for softening undercoatings before sanding and re-varnishing, and for cleaning and softening brushes.

Solox is also an effective general-purpose cleaner for use aboard ship. Used in combination with soap it dissolves difficult stains and removes most kinds of dirt and grease. A mixture of one-third Solox and two-thirds water rapidly softens dirt, fly specks, and oil spots on glass, leaving a clean, brilliant surface. Solox also removes dirt, oil, and water from metal surfaces and helps prevent corrosion.

### Many Applications in Other Fields

Because of its general utility characteristics, Solox is also used in preference to completely denatured alcohol in a number of products and processes outside of the marine field. Lacquer manufacturers have found that 20 per cent Solox with 80 per cent toluol is

**MORE**

## New Germicidal Powder Emits Its Own Light

Tests of a new medical powder, for use in both wet and dry dressings, have shown its unusual germicidal action. The new germicide, said to emit light in the ultraviolet range, was used on 22 cases of infected wounds, 20 of which had not responded to sulfa and other treatments. All the patients recovered. The powder is reported to contain chloramine T, potassium iodide, dextrose, and sodium biphosphate, and has a pH just over 7 in solution at room temperature.



Photo by Jack F. Loar

Air view of the Carthage Hydrocol, Inc., Stanolind Oil and Gas Company, and U.S.I. projects at Brownsville, Texas. On the right is the Carthage synthesis plant where natural gas will be converted to synthetic gasoline, other petroleum products, and crude chemicals. The chemicals will be recovered and refined in the Stanolind plant, center background, and then will be prepared for market by U.S.I., whose facilities are shown on the left. Early operation of the facilities pictured above is anticipated.

January

★

# U.S.I. CHEMICAL NEWS

★

1950

## Plastic Bags Aid Mixing Of Ingredients That Stain

A plastic-film bag which can be filled with a specified amount of an ingredient and then placed right in the mixing batch of certain types of products during their manufacture has been developed. The bag, which disintegrates in the mix, is designed for use with ingredients that cannot be handled without staining equipment.

## 'Urethan' without the 'e'

Urethan, an important ingredient in a number of pharmaceutical preparations and a raw material in the synthesis of many drugs and chemicals will be spelled without a final "e" in the U. S. Pharmacopoeia XIV. In making this announcement, the Committee of Revision added that the old spelling, "urethane," will be carried as a synonym to the title. U.S.I. is a major producer of Urethan, U.S.P.

CONTINUED

## Solox For Marine Use

one of the most powerful solvent combinations for ethyl cellulose. This mixture gives low viscosity solutions and superior final films. A mixture of Solox and ethylene dichloride is a popular solvent for cellulose acetate butyrate lacquers, and Solox in combination with toluol may be used as a diluent to replace denatured alcohol in cellulose acetate lacquer formulations.

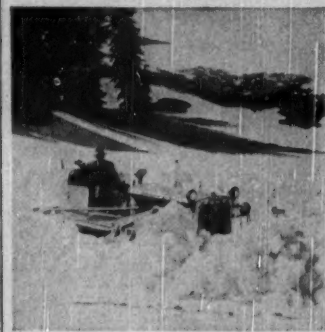
### Used in Chemical Manufacture

Solox is employed in various chemical purifying and recrystallizing operations. Anhydrous Solox is often used as a reaction medium for chemical processes which will not go forward in the presence of water. Solox can also be used to furnish the ethyl group in chemical manufacturing processes where its denaturants are compatible with the other reactants.

Other applications for Solox include its use as an ingredient in airplane carburetor and propeller de-icing; for removing water and sludge from fuel oil tanks; for rinsing photographic negatives and prints, and cleaning ferrotype plates; and as an ingredient in the production of paint removers, liquid cements, polishes, and water-proofing materials.

## Ethyl Ether Helps Start Diesels in Cold Weather

Recent tests in this country, Britain, and Germany are claimed to have demonstrated that the use of ethyl ether as a priming agent is the most effective and potentially the most convenient method of starting diesel engines in cold weather. Diesel engine cold starting is said not to respond significantly to improvements in fuel cetane numbers, regardless of



the use of ignition accelerators. Although starting accessories like glow plugs and jacket heaters may be satisfactory for some applications, they are sometimes unreliable, inconvenient, and expensive.

## New Chemical Process For Polishing Metals

Metal products can now be given a bright, reflective surface without the need of mechanical or electrical operations, it is reported. In the new process the product is merely dipped into a chemical solution and when withdrawn a few minutes later is described as having a high, mirror-like luster. Chief advantage claimed for the new process in production is its simplicity—it may eliminate from one to four or five production steps in the finishing of a metallic product. Metals that can be polished successfully by the new process are said to include brass, copper, Monel, nickel, and aluminum.

## TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

**Fast, cold-removal of paint, varnish, lacquer, synthetic enamel, and Japan finishes, without chemical after-wash, is claimed possible with a new paint remover, described as fire- and explosion-resistant, harmless to fabrics and polished metals, and non-irritating to the hands.**

(No. 538)

**A new finishing treatment for polyethylene fabrics pre-shrinks them to less than 2% residual shrinkage at temperatures up to 165°F. It is claimed.**

(No. 539)

**To speed up emptying of tank cars and to permit many viscous materials to be handled in cars not fitted with steam coils, new immersion-type steam heaters are on the market. The heaters can be handled safely by one man, the makers state.**

(No. 531)

**A new flame-retardant chemical for cotton and rayon does not change the appearance or feel of these materials, it is claimed. Durable to dry-cleaning, normal home laundering, and weathering, it reportedly reacts chemically with the fabric fibers rather than merely coating their surfaces.**

(No. 532)

**Rubbers with high resistance to heat, oil, light, ozone, discoloration, and gas diffusion, and which retain flexibility and elasticity under compression are said to be available. They are reported based on acrylic esters and, though saturated, to be vulcanizable.**

(No. 533)

**Cars or trucks stuck in snow, ice, mud, or sand can be easily driven out of difficulty using a new inexpensive device, it is reported. The device is said to provide a non-slip tread that does not cut or otherwise damage tires. It can be stored conveniently in the car, the makers claim.**

(No. 534)

**An all nylon typing ribbon, claimed to produce exceptionally sharp, clear impressions and to be extremely durable, is now on the market.**

(No. 535)

**A new low-cost adhesive for labeling glass bottles and jars, described as resistant to temperature and humidity extremes, is said to do a good job on wet, stippled, or slightly greasy containers, to be fast-setting, and to have ability to run continuously without building up on labeling machines.**

(No. 536)

**A new, odorless, one coat flat oil paint permits interior painting without opening windows for ventilation, comfortable occupation of rooms during and after painting, and increased application efficiency, according to the manufacturers.**

(No. 537)

**New "ductile" cast iron that is not brittle but can be bent or twisted is reported available now for many and varied uses. It has several times greater strength than ordinary cast iron and greatly increased ductility and shock-resistance, the makers claim.**

(No. 538)

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### ANTI-FREEZES

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### ANISOLS

Anisol M  
Anisol P

\*Registered Trade Mark

### ACETIC ESTERS

Amal Acetate  
Butyl Acetate  
Ethyl Acetate

### OXALIC ESTERS

Diethyl Oxalate  
Diethyl Oxalate  
y

### PHTHALIC ESTERS

Diethyl Pthalate  
Diethyl Pthalate  
Diethyl Pthalate

### OTHER ESTERS

\*Diethyl  
Diethyl Carbamate  
Ethyl Chloroacetate

### INTERMEDIATES

Acetobromide  
Acetocetyl chloride  
Acetocetyl chloride  
Acetocetyl chloride  
Acetocetyl chloride  
Ethyl Acetoacetate  
Ethyl Benzoylacetate  
Ethyl Sodium Oxalacetate

### ETHERS

Ethyl Ether—U.S.P.  
Ethyl Ether—Absolute—A.C.S.

### FEED PRODUCTS

\*Kaffeein Concentrates  
\*Nucleon B.C. \*Essential Liquid Carboxy

### ACETONE

Acetone—Pure

### RESINS (Synthetic and Natural)

\*Acrylic—alkyl and glycidyl materials  
\*Alkyd—pure phenolics  
\*Alkyd—modified types  
Ester Gums—All types  
\*Gum—Gum—Resin & varnish  
Natural Resins—all standard grades

### INSECTICIDE MATERIALS

\*P.P. Concentrates  
\*Parathion  
\*Phosphamidon  
\*Permethrin  
\*Pyrethrum Products  
\*Rotenone Products

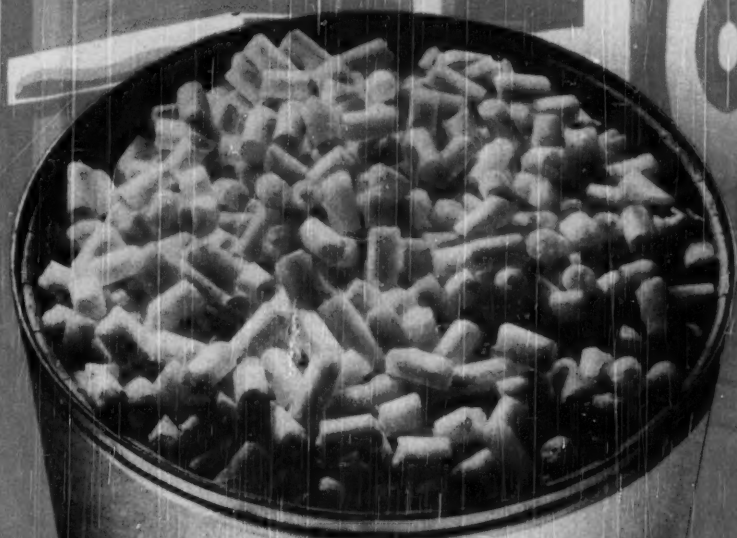
### INSECTIFUGE MATERIALS

\*Isodolene  
Triple Mix Repellents

### OTHER PRODUCTS

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Cellulose Solutions  
Ethylenes  
Urethan, U.S.P.  
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for  
uniform  
resin  
mixtures

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Uniform-size, easy to handle Maleic Anhydride "RODS" save labor, improve working conditions, cut costs, add safety. They are one more example of the forward-looking service you get from Coating-Resin Chemical Headquarters.

*National Aniline*

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Philadelphia 6, Pa. 200-284 S. Front St.  
San Francisco, Cal. 517 Howard St.  
Charlotte 1, N. C. 261-262 West First St.

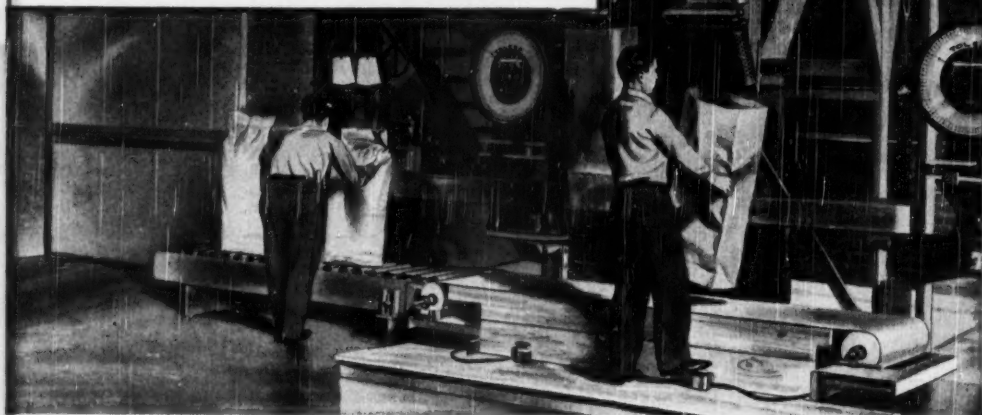
Captial 6490  
Dexter 3088  
SOpport 7-3387  
Llombard 3-6382  
Sutter 7507  
Charlotte 3-9221

Greensboro, N. C. Jefferson Standard Bldg.  
Atlanta 2, Ga. 140 Peachtree St.  
Chattanooga 2, Tenn. James Building  
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**PURIFICATION,  
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If your processing includes purification, isolation or upgrading of organic materials, selective separation with Davison Silica Gel may help you produce a better product at a lower cost.


Research and pilot plant work by some of the nation's largest chemical concerns indicate that, in many cases, selective separation is a cheaper and more thorough process than either distillation or crystallization.

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Write for data sheets, samples and technical information . . . or ask to have a Davison field representative call.

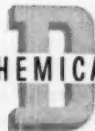
**typical separations:**



Acetylene from Oxygen  
Aromatics from Paraffins  
Sulfur Compounds from  
Hydrocarbons  
Polar Compounds from  
Non-Polar Compounds  
Moisture from Organic  
Liquids and Gases

**THE DAVISON CHEMICAL CORPORATION**

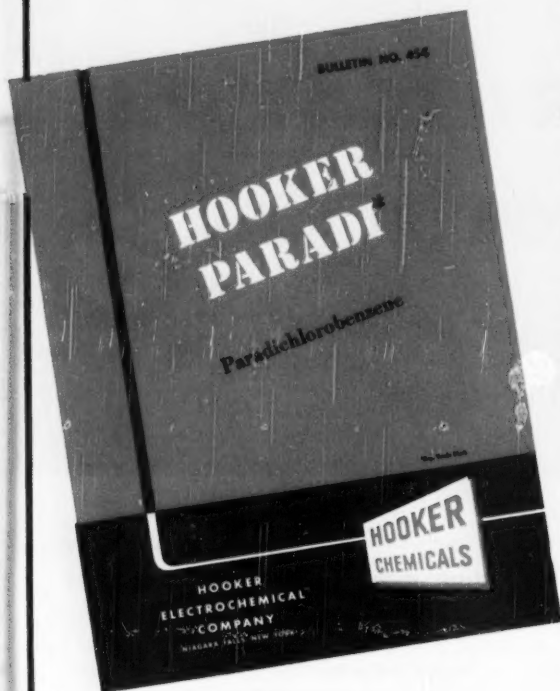
*Progress through Chemistry*



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A request on your company letterhead will bring this bulletin to you promptly. Chemists who are interested in other physical and chemical properties should ask for Technical Data Sheet 749.

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HOOKER ELECTROCHEMICAL COMPANY

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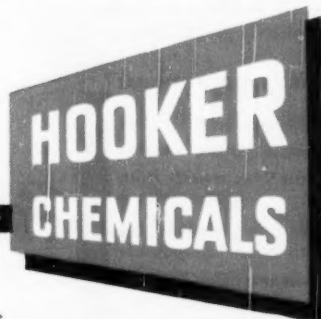
HOOKER's new Bulletin No. 454 on Paradichlorobenzene can be your guide to increased sales and profits if you are interested in the fumigant, deodorant and disinfectant markets. It describes the many uses and application of paradichlorobenzene, methods for reforming and repackaging—contains a table and illustrations of exact screen sizes—just the information a repackager or specialty manufacturer needs.

Hooker Paradichlorobenzene is a crystal clear, high purity product that evaporates completely, leaving no residue and no stains. It is not injurious to fabrics, furs or hides and is not poisonous to human beings.

It is made available in seven graduated sizes from powdered to Pea No. 1 (Screen size through  $\frac{5}{8}$ " on  $2\frac{1}{2}$ ").

## TYPICAL PROPERTIES HOOKER PARADICHLOROBENZENE

Appearance.....	White to clear transparent
Form.....	Crystals in 7 sizes
Melting Point.....	53°C
Boiling Point.....	173°C
Residue on Sublimation.....	None
Shipping Containers.....	25, 50, 100, 200 lb. Fibre Drums



9-1587

SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

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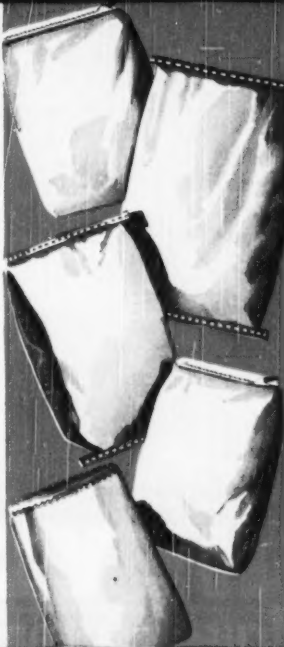


The long, white building in the foreground is the newly completed addition to the Kraft Bag Corporation's plant in St. Marys, Georgia.

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Send your product to market in a "KRAFT BAG"—the container for a thousand uses!

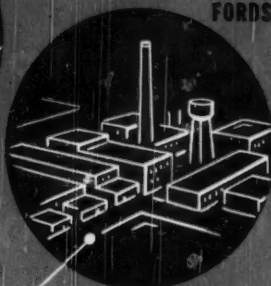
# These 5 HEYDEN MODERN PLANTS

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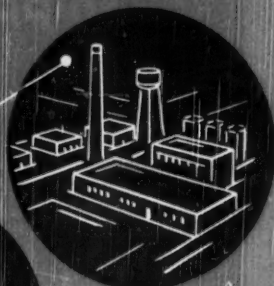
Benzaldehyde • Benzoates  
Benzyl Chloride • Bromides  
Chlorinated Aromatics  
Chlorobenzenes • Creosotes  
2,4-D • Formaldehyde • Formic Acid  
Glycerophosphates • Guaiacols  
Hexamethylenetetramine  
Medicinal Colloids • Methylene  
Disalicylic Acid • Paraformaldehyde  
Parahydroxybenzoates  
Penicillin • Pentaerythritols • Propyl  
Gallate • Quadrafos • Salicylates  
Salicylic Acid • Streptomycin



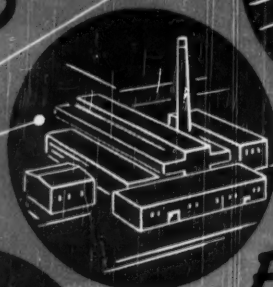
GARFIELD, N. J.



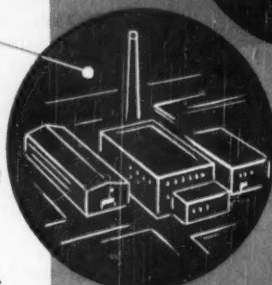
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## CHEMICAL CORPORATION

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# Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

Newsletter,  
January, 1950

## For Your Information:

More competition in acrylic esters: Carbide and Carbon Chemicals Corp. will begin commercial production of acrylate esters early this year. First product: ethyl acrylate. Not as well-known as the methacrylates, these esters still are large-volume components of copolymer plastics, adhesives, and lubricating oil additives.

A small (100 tons per day) packaged unit to solvent-extract soybeans has been developed by the Chemical Plants Division, Blaw-Knox Co. Designed to supply relatively small, local demands for oil and meal, the units are based on Blaw-Knox's new rotary extractor, the Rotocel. First commercial installation of the latter, a much larger unit, will be completed soon.

\* \* CI \* \*

A benzene crisis will be precipitated by any major increase in demand for its derivatives: styrene, synthetic rubber, phenol, aniline, or nylon. You can add to that the possibility of smaller supply if steel production falls off. Benzene from petroleum may materialize if price goes above 30¢ a gallon. (Current price after latest increase is 22¢.) Silver lining: more nylon from petroleum cyclohexane.

Almost every major oil company on the West Coast is keeping a sharp eye on possibilities for an ethylene-based chemical industry in the West. Ethylene glycol probably would be the initial product. Although the bulk of Western population is in mild-weather territory, winter mountain sports are popular enough to draw large week-end automobile crowds from Los Angeles and San Francisco, and that means anti-freeze—preferably permanent type which will not evaporate at the warmer, sea-level temperatures. Principal deterrent to establishment of glycol production in the West: threat of over-supply in the East.

\* \* CI \* \*

What may be a forward step of basic significance in solving the world's food problem is contained in results of pilot-plant work on photosynthetic protein and fat production at Stanford Research Institute, Stanford, Cal. Continuous-flow, tank-farm culture of Chlorella pyrenoidosa, a one-cell alga, yields 130 times as much protein per acre as soybeans, highest-protein ground crop known. Although high plant investment is expected to hinder immediate

interest in this country, General Mills and Commercial Solvents, among other well-known firms, are eyeing long-term possibilities. By-products which include certain sterols account in part for this interest.

Low-cost hydrazine is hinted at by a U. S. patent (No. 2,484,633) recently issued to Allied Chemical & Dye Corp. The addition product of isobutylene and nitrosyl chloride is treated with hydrogen chloride in an organic reaction medium until it becomes liquid. Upon treatment with an alcohol it rearranges and is reduced to yield hydrazine dihydrochloride and organic co-products. Raw materials are cheap, and the reaction requires only two steps.

\* \* CI \* \*

Crystal Research Laboratories, Hartford, is now manufacturing a small (5½ lbs.), five-gallons-per-hour, mixed Amberlite bed demineralizer. The unit is priced at \$39.50, and replacement demineralizer cartridges cost \$1.95. The unit produces one-million-ohm water from Hartford tap water for 2½-5¢ a gallon. It will be aimed at doctors' offices, clinical labs, and other small-quantity users of distilled water.

Aerosols continue to be the big news in the specialties field: Latest company in the aerosol filling business (bringing the total to eighteen) is Fluid Chemicals, Inc.—now tooling up at its Newark, N. J., location. Fluid hopes to be operating within a month, is geared to produce 50,000 cans a day....Carand Corp., Racine, Wis., is now distributing an aerosol in the Racine and Milwaukee areas for removal of adhesive tape. Called Tapeway, it's for the professional trade, contains a solvent with a wetting agent....Connecticut Chemical Research Corp., the Bridgeport aerosol filler, is readying a new, complete line of valves for aerosols, including one for foam products....Foam hair shampoos, incidentally, are being eyed by all aerosol fillers.

\* \* CI \* \*

#### Here and There:

Making excellent headway in a highly competitive field is Weyerhaeuser Timber Co.'s new phenolic molding compound, which uses a bark filler and only about half as much resin as comparable materials. The company expects to produce about 50% more this year than last....R. M. Hollingshead, Camden, N. J., will soon bring out its new Whiz Lusterize Cleaner, a surface-active solvent-type cleaner for use before waxing cars, furniture, etc....Hewitt Soap Co., (P & G subsidiary) is selling a bactericidal soap called Chex in the Mid-west and upper New York State. It contains Givaudan-Delawanna's G-11, sells for a quarter.

Submerged-culture aerobic fermentation is now being used by Hoffman-La Roche, Inc., to produce l-sorbose from d-sorbitol. The sorbose is raw material for vitamin C (ascorbic acid) synthesis....At least five firms—all of them old hands at fermentation—are battling for the vitamin B-12 (anti-anemia factor) business: Merck, Pfizer, Squibb, Abbott, and Schenley....Chemical Process Co., Redwood City, Cal., will soon start manufacturing polystyrene based resin for cation exchange....American Cyanamid is now offering a series of guanidine phosphate-based fire resistant finishes for textiles under the trade name Pyroset. More durable than previous similar materials, they resist laundering with neutral soap.

*The Editors*

# Those who know order Phthalic *Plus*

Buyers who went through the shortage of Phthalic learned the *plus* value of a dependable source of supply. Koppers customers profited from the *plus* value of delivery of Phthalic as promised.

Unfortunately, and much to our regret, limited plant capacity made it impossible to take care of more users. A larger plant was the answer. It was built and is now in operation. As a major producer of naphthalene, Koppers *has and will have* an ample supply of raw materials.

If you remember the past, and are looking to the future, let's discuss your Phthalic Anhydride requirements. We would like to be your dependable source.



**KOPPERS COMPANY, INC.**

*Chemical Division*

Pittsburgh 19, Pa.



Koppers Phthalic Anhydride is unsurpassed in purity and is readily available in multi-walled paper bags containing 80 pounds.



*Forty Years of Progress*



BICHROMATE of SODA  
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SODIUM SULFATE  
SODIUM CHROMATE

QUALITY AND UNIFORMITY



JERSEY CITY, N. J.

## CHEMICAL INDUSTRY, 1950

by ROBERT L. TAYLOR, Editor

A RANDOM CHECK BY THIS MAGAZINE of 1950 thinking among industrial chemical manufacturers indicates that a lot of people will be disappointed if the chemical business this year isn't as good or better than last. A majority of producers queried expect to wind up the year with gross dollar sales slightly ahead of 1949. This is despite expectations of further price declines in some lines.

On profits, opinion is considerably less crystallized. But even there, the feeling is strong that opportunities for cost-cutting have not been so exhausted that further progress in this direction could not do much to stave off any drastic squeeze.

IS THIS TOO ROSY AN OUTLOOK? Maybe, for almost any other field than chemicals. But for the diversified chemical industry we believe it is a reasonable forecast.

Consensus of business leaders and economists is that 1950 will be a plateau year for the domestic economy in general. Dollar output for the year is expected to show little change one way or the other from 1949.

If this proves true, total chemical production and sales should be in for a small increase, if for no other reason than that the growth rate of the chemical industry has yet shown no sign of coming down from its peg several points above that for industry as a whole.

This higher-than-average growth rate has long been a characteristic of chemicals production. It has been maintained partly by the continued encroachment of synthetics upon the territories of natural materials, both as direct replacements and as upgrading agents, and partly by the introduction of brand new materials which have created their own new uses and new markets.

In neither of these processes has there been any evidence of a slowing down. If anything, they seem to be self-catalyzing. They are

taking place over a wider area and at a faster pace today than ever before.

These factors, when placed atop an apparent balance of upside and downside forces in the general economic picture, point to a good year ahead for chemicals and a continued abundance of opportunities in this great industry for those with ideas and enterprise.

### The Point Four Program

ACTION BY THE NEW CONGRESS to implement the President's Point Four program will be watched with much interest by the chemical industry. Several major chemical companies are already sizing up possibilities for operations abroad under the new program.

Essentially Point Four is designed to provide technical assistance to underdeveloped areas of the world through American investment in those areas. It has been offered by the Administration as a practical alternative to continuing indefinitely to make up the world's dollar shortages from out of the American taxpayer's pocket.

This is certainly a worthwhile objective.

Interested chemical makers will do well, however, to help impress upon the law makers the importance of government's role in creating and continuing the kind of political climate both here and abroad that is necessary to attract private American capital to foreign countries.

That has always been the big obstacle to sending American know-how abroad. If that problem can be solved, Point Four can provide one of the great opportunities of the century to America and the world.

### Happy Reading!

In keeping with our aim to make the acquiring of chemical information as much a pleasure and as little a chore as possible, we have this month increased the size of the type used in CHEMICAL INDUSTRIES. Hope you like it.

**USEFUL** as powerful reducing agents

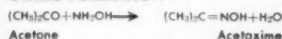
**USEFUL** in the manufacture of rust & polymerization inhibitors • dyes & intermediates • pharmaceuticals • photographic chemicals • rubber chemicals

# hydroxylamine salts

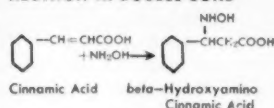
HYDROXYLAMMONIUM CHLORIDE  
HYDROXYLAMMONIUM SULFATE  
HYDROXYLAMMONIUM ACID SULFATE

## TYPICAL REACTIONS

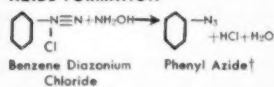
### OXIME FORMATION



### ADDITION AT DOUBLE BOND



### AZIDE FORMATION



<sup>†</sup>Due to the known instability of azide compounds, adequate safety precautions should be observed in attempting this synthesis.



The acid sulfate is the most economical source of hydroxylamine but where a purer product is necessary, the sulfate or chloride is recommended. The chloride is usually chosen for reagent purposes, such as in the determination or removal of aldehydes and ketones because it is the most soluble of the three salts in organic liquids. Therefore, it is also preferred when carrying out syntheses in non-aqueous media.

## PROPERTIES

	Hydroxylammonium Chloride NH <sub>2</sub> OH • HCl	Hydroxylammonium Sulfate (NH <sub>2</sub> OH) <sub>2</sub> • H <sub>2</sub> SO <sub>4</sub>	Hydroxylammonium Acid Sulfate NH <sub>2</sub> OH • H <sub>2</sub> SO <sub>4</sub>
Molecular Weight	69.50	164.14	131.11
Melting Point °C	152d.	162d.	Indefinite
pH of 0.1M Aqueous Solution at 25 °C	3.4	3.5	1.6
*Solubility—g/100g at 25 °C			
In Water	94.7	63.9	390 Approx.
In Methanol	17.5	0.1	20.2
In Ethanol, 95%	10.5	0.2	4.3
In Ethanol, Absolute	6.6	0.1	6.3
In Butanol	0.6	0.03	2.2

\*These Hydroxylammonium salts are only very slightly soluble in ethers, esters, and aliphatic or aromatic hydrocarbons

Write, wire, or phone CSC for a sample and further information

**COMMERCIAL SOLVENTS CORPORATION**

INDUSTRIAL CHEMICAL DIVISION • 17 EAST 2ND STREET, NEW YORK 17, N. Y.

Chemical Industries

## What's new

### THE DESERT ENCROACHES

Sparser water supply is persuading process engineers to adopt alternate cooling means, to achieve better integration and higher efficiency in its use.

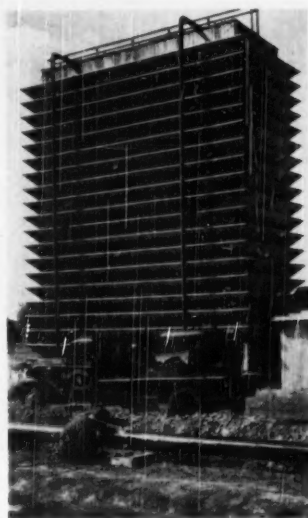
IT IS A moot point whether water or air is the most important raw material for the process industries. An unlimited supply of air is available everywhere on the earth's surface, but the same can't be said, unfortunately, for water. Because of this an adequate supply of water, first for agriculture and more recently for industry, has long controlled the locations for the world's centers of civilization.

No longer are the problems imposed by an insufficiency of water confined to the arid regions. Population expansion and an even more rapid expansion of industry, particularly the process industries, has brought serious supply problems to areas where water has always been thought sufficient. A sign of growing recognition of the problem is the recent symposium on this subject held by the New York section of the American Institute of Chemical Engineers.

In one of the suburbs of Chicago, which has harbored a number of large water-consuming industries for years, the water table is dropping nearly fifty feet per year. Currently the depth of the wells is about 600 feet. But unless the downward progress of the water table is halted, the well depth may soon be comparable to that of a shallow oil well.

New York has a very desirable law: It requires all water users on Long Island to return used, unpolluted water to the producing sands. The law has accomplished its purpose. It has helped prevent the further encroachment of salt water into sands which formerly produced fresh water. However, it is imposing still another problem: Used, unpolluted water finds its major utility as a coolant. This heated water is now being returned to the sands in such large volume that the average water temperature is showing an appreciable increase, necessitating larger capital investment for heat exchange surface.

Such examples as these (there are many more), plus the rapid expansion of the process industries into such relatively water-short areas as Texas



COOLING TOWER: A thousandth as expansive.

and California, have called for a much more thorough study of ways and means to use water more efficiently; greater reuse of cooling water via cooling towers or spray ponds; use of sea or other saline waters; and utilization of air as a coolant.

Another factor is working, to a certain extent, in the opposite direction: improvement in water treatment processes. Industry, instead of going where water of proper purity is available, is more and more able economically to treat an existing supply to get water of the prescribed purity. The newer ion exchangers permit removal of either all or part of the mineral content.

#### Water Reuse

Reuse is today probably the most important means of achieving water economy. The simplest method for removing the excess BTU's accumulated in process is to utilize natural cooling

—pumping the water into a lake or reservoir to permit evaporative cooling from the lake's surface. Although this method is economical, consumptionwise, it is truly profligate in its demand for land areas sufficiently large to accommodate even a small process plant. The answer: to provide more surface and increase the velocity of the cooling air moving past this surface.

The first step taken was to increase the area of the exposed surface by installing spray nozzles over a pond. The spray pond thus formed required only about 2% of the land area required by a lake or cooling pond. But losses from windage are relatively high. These were prevented by the installation of louvers to catch the drifting water particles. This combination, in effect, formed the first natural-draft cooling tower. Today's high-capacity mechanical-draft cooling towers are the final result of this evolution. The mechanical draft further increases capacity by increasing the velocity of the air moving past the water surface.

For a given amount of cooling, a modern cooling tower requires about 5% of the land area required by a spray pond—0.1% of the land area required by lake or pond cooling. Loadings as high as 10 gpm per sq. ft. have been attained. Proper design of a cooling water system permits reuse of water as many as fifty times, as is done by Celanese Corp. at Bishop, Texas (*CI, Feb. 1949, p. 240*).

Finally comes the time when the cooling load is greater than the combination of low-cost water and cooling towers can carry. Air can be used, but a plant near a coast can turn for cooling water to the inexhaustible sea.

#### Sea Water

Two major problems are involved if sea water is to be used for cooling and usually they increase the capital cost of the equipment. First, alloys that are unattacked by sea water are relatively limited, thus increasing the initial cost of any heat-exchange device; second, sea water is usually loaded with marine growths and other finely divided organic matter that foul the heat-exchange surface and rapidly reduce the transfer rate. Certain high-copper alloys, where the copper is dis-

solved rapidly enough to provide a toxic dose of a copper salt, prevent the deposit and growth of these organic bodies on the heat-exchange surface.

The search for alloys to withstand attack by salt water dates back to the time that metal was first used in the construction of oceangoing vessels. Of more recent vintage is the search for process equipment alloys but the huge research station which industry maintains at Kure Beach, N. C., points up the present interest in the possibilities of sea water not only as a source of raw materials but also for process cooling.

Rarely is the process engineer baffled when it becomes necessary or desirable to use sea water for cooling. Although the initial cost of the heat exchanger may be greater than one utilizing fresh water, the overall cost of the cooling system may well be lower. Undoubtedly the use of sea water will continue to increase as the readily available low-cost fresh water supplies continue to dwindle.

Air cooling is a water problem if one realizes that unless air cooling were used, water would be required in its stead.

In general, the initial capital cost of an air-cooled heat exchanger is higher than that of a water-cooled exchanger doing the same job, but this difference usually disappears when the temperature difference that can be maintained at the outlet exceeds 40° F. For air-cooled exchangers the lowest practicable temperature difference is 10° F.

Because of this, air-cooled and water-cooled exchangers are often used in series. Air-cooling is utilized within the aforementioned limits and is followed by water cooling to reduce the temperature to the ultimate desired level. The load on the water-cooled exchanger is thus reduced with a consequent reduction in water requirements.

### Increased Integration and Control

There are many other significant facets of the water supply problem: The matter of waste disposal is agitating both public and private organizations as a concerted effort is made to clean up the streams. However, polluted water can usually be readily treated to serve process cooling purposes. Prevention of marine growths and scale formation are the principal problems. The first does not become of major importance unless the inlet water temperature is fairly high; it is fairly readily controlled by various additives. Scale formation can usually be checked by ion-exchange or lime-soda softening.



The Dow Chemical Co.

**SEAWATER:** Many problems, but supply isn't one.

The coming years will probably see further rapid integration of the procedures discussed. More attention will be given to the effect that a cooling operation will have on water consumption and overall operation of the process. The ultimate—already being approached in some plants—is the point where as much attention is given to the integration into process design of water flow and method of cooling as is now given to the flow and handling of reactants and products.

## CAVEAT VENDOR

**Trend to impose stricter liability upon manufacturer or distributor in damages actions revealed in court decision.**

MANUFACTURERS and distributors of synthetic organic chemicals for agriculture have had trying times over the past several years. Resistant insects, restrictions on use in some states, excessive publicity about the dangers of the new materials and the still unsettled question of tolerances for toxic residues are a few sources of industry headaches.

That isn't all, for there's a new one in a recent court decision concerning liability in damages actions resulting from use of such products: In its decision involving damages from the use of 2,4-D, the Supreme Court of Arkansas held that the manufacturer or distributor of an inherently dangerous product will be held to a strict degree of liability for damage arising from the use of that product.

In this case, an airplane operator hired by the Elms Planting Co., Alt-

heimer, Ark., to dust its rice fields with 2,4-D carried out his job on a calm day and apparently exercised the usual precautions. But some of it drifted and settled on a cotton field three-quarters of a mile away. The owner, his crop damaged, brought suit against the rice field owner who, in turn, impleaded the Chapman Chemical Co., seller of the 2,4-D.

### Usual Precautions, But . . .

A jury found in favor of the rice field owner and against Chapman Chemical Co. The jury was instructed that "it was the duty of the defendant, Chapman Chemical Co., before putting an inherently dangerous product on the market, to make tests to determine whether or not it would damage the crops of others. . . ." It was further told to find the chemical company negligent if the evidence showed that the 2,4-D was an inherently dangerous product, liable to damage others' crops, and that the company had not made such tests. Apparently the jury found that the company had made insufficient tests to determine the extent of drift of the material.

The case was appealed to the State Supreme Court which in discussing the degree of care to which a company marketing a product classed as inherently dangerous would be held, said: "If one casts into the air a substance which he knows may do damage to others and in some circumstances will certainly do so, principles of elementary justice, as well as the best public policy, require that he know how far the substance will carry or be conveyed through the air and what damage it will do in the path of its journey, and if he releases such a substance, either from ignorance of, or an indifference to the damages that may be done, the rule of strict liability should be implied."

The Court stated that the question of whether a product was inherently dangerous and therefore subject to a strict degree of liability, was a question of law for it to decide. The lack of privity of contract which had been heretofore considered a defense in many such cases was brushed aside with the statement that "foreseeability and not privity" is the proper test of liability. That Chapman Chemical Co. had nothing to do with the plaintiff (no privity of contract) until it found itself in court was no defense; apparently it should have foreseen the possibility of such damages being caused by the purchaser of its 2,4-D.

### Tough Spot

This new concept of liability is not

conductive to ease of mind for a manufacturer or distributor of 2,4-D or any other product that may cause damages when used by another party. Some such label as "not to be used in winds over three miles per hour velocity" might be considered a limitation on the "inherently dangerous" nature of the product. However, even then if accidents occur, it still might be decided that the manufacturer or distributor is liable for damages arising out of such accidents. Companies will think twice before recommending plane dusting with their product under such a set-up.

## SNIFFLE SNAFFLES

**Anti-histamine cold curbs are pharmaceutical sensation of the year.**

CAPTAIN John Brewster a Navy doctor at Great Lakes Naval Hospital, didn't realize that he was touching off a revolution. A couple of years ago, when he was investigating the effect of anti-histaminic drugs on allergy patients, he noticed that one of his patients who had complained of a cold just before undergoing treatment miraculously lost his symptoms. He quickly extended his studies to 572 patients, reported that 70 to 90% were cured, depending on how soon they got the drug after catching cold.

About the same time Dr. John Gordon, working with 500 college students in North Carolina, obtained and reported similar results.

### Under Doctor's Care

Both Brewster and Gordon were working with commercial anti-histamine preparations sold on prescription. As far back as 1933 French laboratories reported the effectiveness of anti-histamines in combatting hay fever, hives, and other allergy manifestations. Many were synthesized and sold in this country, but their toxic side-effects made over-the-counter sale too much of a risk. They were ethical products (i.e., promoted to doctors for prescription sales) the use of which had to be closely supervised by physicians, since many of them caused drowsiness, dizziness, nausea, headaches, or fainting spells.

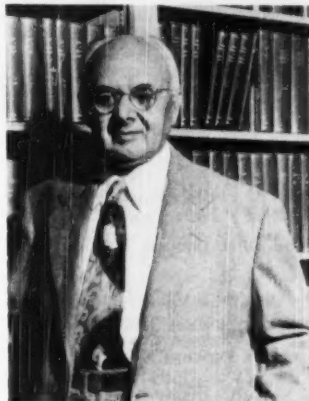
Only a couple of years before Brewster's work, symptoms of the common cold were linked with histamine, a complex, mysterious constituent of all normal tissues that occasionally runs amok and gives rise to allergic symptoms.

This, then, was the situation a few short months ago: On the one hand were colds, not only a personal nuisance

but a billion-dollar-a-year economic waste, demonstrably curable by anti-histamines. On the other hand were the anti-histamines, demonstrably effective but too dangerous for unrestricted sale.

### Over the Counter

Federal Food and Drug Administration approval was the hurdle, and pharmaceutical companies feverishly groomed their favorite compounds for the jump. Nepara Chemical Co., Yonkers, N. Y., got there first last September with Neohetramine, a compound developed three years earlier by its research director, Edmond Tisza,



EDMOND TISZA: Got there first

and sold on prescription through Wyeth, Inc., Philadelphia, an American Home Products Co. subsidiary. Nepara set up Anahist, Inc., (*CI Newsletter*, December 1949) to market the drug under the trade name, Anahist, and is reportedly spending \$1 million this year on advertising. A strong Anahist selling point: It is the only over-the-counter anti-histaminic that isn't required to carry a drowsiness warning on the label.

Second over the barrier but first on druggists' shelves was Inhiston, product of Schering Corp.'s subsidiary, Union Pharmaceutical Co., Bloomfield, N. J. Inhiston was formerly sold ethically under the name Trimeton. Union is also spending \$1 million on advertising, and output is already well over 2 million pills a day.

The new remedies are already out-selling aspirin in some drug chains, and general acceptance will mean a continuing source of profit both to the drug industry and its chemical suppliers. Basis of most of the compounds is dimethylaminoethanol, which is combined with such aromatics as

aminopyrimidine, anisaldehyde, benzyl alcohol, thiophene derivatives, etc. Total production could hardly surpass 500 tons a year; so while the dollar volume might be substantial, the market provided for intermediates would still be relatively small.

### Scramble for a Share

Other firms are not sitting back watching Anahist and Inhiston divvy the millions-a-month business between themselves. Whitehall Pharmacal Co., an American Home Products subsidiary, is promoting Kriptin, based on Merck & Co.'s ethical anti-histamine, Neo-Antergan. Bristol-Myers, whose product is called Resistab, buys its material from Anahist. Grove Laboratories, whose old-line Four-Way Cold Tablets are outmoded by the newcomers, is on the bandwagon with Antamine, also based on Neo-Antergan.

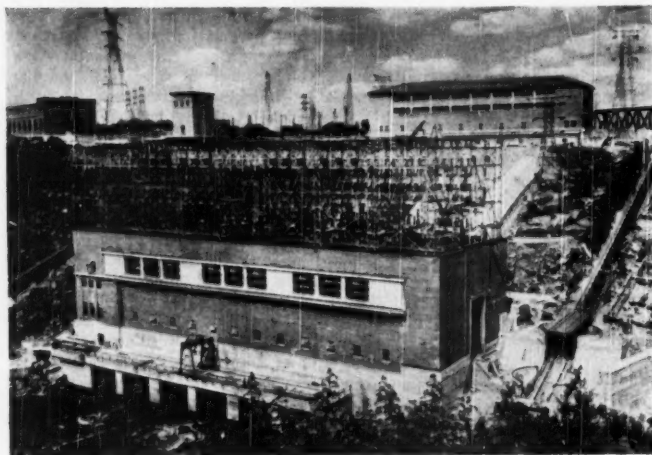
The ethical drug houses, meanwhile, are scrambling to treat the colds that come to the doctor's office: Merck, Wyeth, Eli Lilly and Co. (Histadyl), Ciba Pharmaceutical Products, Inc. (Pyribenzamine), and Hoffmann-La Roche, Inc. (Theophorin). Just last month Sterling-Winthrop Research Institute's C. M. Suter revealed a new prescription anti-histaminic, Thenfadil.

### Too Extravagant?

The evidence for the new drugs' effectiveness seems overwhelming. Anahist was tested last winter (starting in October, 1948) on 3,000 volunteers at Sing Sing Prison and Maryknoll Convent and Seminary, Ossining, N. Y. Recommended dosages were given to some of them daily over a six months' period without ill effects, and 90 per cent of them remained cold-free. At Sylvania Electric Products, Inc., 1,000 employees received the drug last winter with similar encouraging results.

Yet there is the danger that these products, good as they are, may be "oversold" to a trusting public. "It is to be thoroughly understood," says Dr. H. E. Tebrock, Sylvania's medical director, "that these new anti-histaminic drugs are not a cure for the common cold, but merely alleviate the symptoms if administered promptly."

All colds won't be stopped, but current advertising makes no allowance for exceptions. The Government will keep an eagle eye on labels and advertising and be on the lookout for dangers arising from the drugs' use. If they work safely and effectively under the hit-and-miss conditions of unsupervised self-treatment, they may well become and remain the largest-selling class of home remedies.



195,000 HP MORE FOR SHAWINIGAN: . . . only the beginning.

## PIG IRON AND PIGMENT

Ilmenite will be converted to pig iron and high-titanium slag in new electric smelter at Sorel, Quebec.

ONE of the largest single postwar industrial developments is now well under way at Sorel, Quebec, where three major United States and Canadian companies will attack the problem of recovering iron and titanium dioxide from ilmenite. The mining of the ilmenite and its smelting will be done by Quebec Iron and Titanium Corp., which is under the joint ownership of Kennecott Copper Co. (2/3) and New Jersey Zinc Co. (1/3). The torrent of electric power required will be furnished by the hydroelectric facilities of Shawinigan Water and Power Co.

### Power Supply

The first power contract calls for delivery of 160,000 HP by 1951 (over 10% of Shawinigan's present generating capacity) to Sorel. Cost of the generating capacity to honor this contract will be of the order of \$10 million. Shawinigan recently spent \$12.5 million for a 195,000 HP addition to its generating facilities at Shawinigan Falls—and this is only the beginning. Reportedly a major portion of the power from Shawinigan's new hydroelectric plant at Tremche—generating capacity, 384,000 HP—will be utilized, after it is completed some time in 1951, by Quebec Iron. If so, Shawinigan's stake in the project will approach \$40 million. Some estimates place the total investment of Quebec Iron as high as \$100 million. Most certainly

the overall total new capital involved is greater than this latter figure.

### Expensive Exploring

Another measure of the huge size of this development is the statement before the recent United Nations Conference on Conservation and Utilization of Resources by Anton Gray, vice-president of Kennecott and also president of Quebec Iron. He revealed that the geological exploration of some 1500 square miles to prove this deposit took over three years and cost about \$500,000. (A fifth of that was spent in three months in an aerial magnetometer survey.)

For years ilmenite has been the major raw material for titanium pigments. The conventional procedure for winning these white pigments from ilmenite is to dissolve the whole mass in sulfuric acid. After precipitation of the titanium dioxide, which upon calcination becomes the desired pigment, the residual solution consists principally of ferrous sulfate and sulfuric acid. And in spite of many a furrowed brow, this still remains a waste. National Lead Co. has made some attempts to produce electrolytic iron from it, but that approach has made little if any dent in the waste disposal problem.

More recently E. I. du Pont de Nemours & Co. has operated a process in which chlorine, presumably in the

presence of carbon, is the solubilizing agent for the ilmenite. Little specific information concerning the success of this project is available, but it is known that it has been an operating headache from the start.

### Now, Electric Smelting

Quebec Iron proposes to change this. It plans to use electrical power to smelt ilmenite (about 1800 tons per day) to produce pig iron (about 500 tons) and a high titanium slag (about 700 tons). In contrast to the best grade heretofore available, Travancore ilmenite (up to 60% titanium dioxide), the slag will contain as high as 70% titanium dioxide. This quantity is sufficient to supply nearly half the total North American demand for titanium dioxide.

This will be the product from the Sorel smelter, whose cost was originally estimated to be about \$15 million. Ilmenite will be produced from a large ore body at Lac Tio, Quebec, and shipped 27 miles by a company-owned railroad to the port of Havre St. Pierre on the Gulf of St. Lawrence some 500 miles above Sorel, which is about 50 miles below Montreal. The original cost estimate for the railroad was \$10 million; no mention has been made of the capital required for mining the ilmenite. Further, it is understood that these cost estimates are now in the process of revision. And cost revision during the past few years has been only in one direction!

Titanium concentrates are not titanium pigments. Production of the latter calls for still another operation, and Quebec Iron's project does not envision the construction of a pigment plant. It plans to sell the high-titanium slag to established pigment producers, chiefly in the United States. (New Jersey Zinc, coincidentally, is an established pigment producer.)

### Next, Titanium

The apparent size of the commitment for supplying power seems out of line with the size of the other estimates of capital requirements. Best guess is that, although there are no immediate plans for producing titanium metal, Quebec Iron will be one of the principal suppliers if the present furor over the potentialities of this metal is the precursor of widespread usage. Further support is given to this line of reasoning: Both owners of Quebec Iron are primarily metal-producing companies. And very probably the low power rates available in that part of Canada will play their part in any metal production.

## CANS WITH CLASS

**Distinctive colors, light weight, feature new line of aluminum containers for low-pressure aerosols.**

THE AEROSOL men were buzzing about more than the usual rumors of new products and new competitors at the Chemical Specialties Manufacturers Association meeting in Washington last month. A little blue valise filled with an assortment of brilliantly colored and highly-polished drawn aluminum containers for low-pressure aerosols was on everyone's mind, and competition for sample cans was keen. This looked like the glamour package that could put pressurized products across in the lucrative cosmetics field, add sales appeal to some "hard goods" sellers.

Owner of the blue valise was Phil Meshberg, who with his two brothers, Julius and Louis, runs a 13-year old general metal fabricating business, the American Metal Products Co., in Bridgeport, Connecticut. The brothers Meshberg got into aerosols by way of the two-cup percolator which they started to manufacture along with other housewares after the war. (They had made plane parts, 105 mm guns for the government.) This experience with aluminum housewares fabrication resulted in Phil Meshberg's designing the aluminum alloy container that General Chemical Division

of Allied Chemical & Dye Corp. introduced coincident with its entry into the aerosol field (*CI, May 1949, p. 740*). American Metal Products is now offering this as part of its new line to other manufacturers.

In addition to the usual 12-oz. container, the complete line includes 2-, 4-, 6-, 8-, and 10-oz. sizes. The three small sizes are of the one diameter ( $2\frac{1}{8}$ "") as are the large containers ( $2\frac{1}{2}$ ""), but some variations can be made in the crown of the can.

Anodizing the body of the container or wrapping it with colored aluminum foil opens up practically unlimited possibilities for differentiating products and brands in striking fashion. Even without these embellishments, the appearance of highly-polished aluminum has universal acceptance, and the lightness of the dispenser is another "plus" sales factor. Meshberg will assist companies in their overall container design, and proposes to limit distribution of containers finished in a particular shade. The wide range of sizes, colors and designs available, plus this protection for a distinctive shade—for example—of blue, pink, or maroon, in a given container, should attract, in particular, cosmetics canners to whom individuality is so important.

### Glamour and Price

Meshberg will aim primarily at cosmetics (where many think the biggest

potential market for aerosols lies.) He has good reason for this besides the field's obvious need for glamour goods: they will require smaller sizes generally, and here, he believes, aluminum containers can be competitive with the tinplate containers now commonly used. In the larger sizes, however, where aerosols are only a sideline of the beer can business and most of the manufacturing equipment has been amortized, the new containers will probably be more expensive. (Anodizing, of course, will be extra.) "Hard goods" items nevertheless have not been written off; Meshberg feels that some manufacturers of products like household insecticides or air fresheners will be willing to pay a premium for a product that stands out on a shelf.

With its aluminum containers assuring it a place in the aerosol picture, American Metal Products is looking around for more metal fabricating business there. It is currently working on an aerosol valve, and may go into production in a few months if it thinks there is sufficient market.

## ELECTRONIC TORCH

RADIO often splits a family—when Father wants the ball game and Mother wants "Portia Faces Life"—but the heat is nothing compared with that generated when radio splits molecules. At General Electric Co.'s research laboratory, J. D. Cobine combines high-frequency radio signals and various gases to produce temperatures considerably higher than the melting point of tungsten ( $3,370^{\circ}\text{C.}$ ).

Heart of the torch—which is still in the laboratory stage—is a magnetron, an electron tube that produces radio waves with a frequency of a billion cycles a second. Leading from the tube is an antenna composed of two short metal cylinders, one within the other. An arc is struck on the end of the antenna; and if certain gases—nitrogen and carbon dioxide among them—are fed past the arc, a jet of flame about nine inches long results.

The jet itself is not necessarily hot, but a surface placed in the jet is heated by the recombination of molecules dissociated by the arc. Polyatomic molecules are thus dissociated, and their recombination produces intense heat; monatomic molecules, like argon and helium, give a cool flame.

Commercial possibilities of the torch have yet to be explored, but it will undoubtedly be a convenient tool for studying high-temperature reactions and behavior of materials.



PHIL MESHBERG: Glamour in aerosols.

## TARDY PARTY

**First known vegetable protein gel resembles egg white and has many food and industrial uses.**

A NEW PROTEIN product "Gelsoy," recently developed by the Department of Agriculture at its Northern Regional Research Laboratory in Peoria, Ill., is now being manufactured on a small scale under a cooperative agreement with Allied Mills, Inc., also in Peoria, and may soon be available commercially. Gelsoy has a bland taste, and its whipping, gluing, and gelling properties should give it wide application.



BRANNAN AND DeVoss: Service award for a serviceable gel.

Gelsoy is obtained by a process of fractionating soybean meal; the finished product contains about 55% protein and 45% carbohydrate. It differs from soy whips now on the market in that it has received no hydrolytic treatment.

The improved flavor and gelling properties are developed by a process involving alcohol washing of hexane-extracted soybean flakes. Produced without the heat or steam treatment usual in solvent extraction processing, the alcohol-washed flakes are extracted with water, and that part of the flake dissolved in the water is recovered as a fine white powder by spray drying. A yield of 50-65% on the basis of the original flakes is anticipated in commercial production.

This process is an example of good engineering design. The recovery of the wash alcohol is accomplished not

by distillation but by chilling to 55° F., at which temperature most of the extracted material precipitates, permitting reuse of the alcohol without further purification. By a countercurrent batch water-extraction procedure which raises the dissolved solids content of the solution to about 20%, evaporation or spray-drying costs are materially lowered.

### Meringue Mistake

The late arrival of the persons who were to watch a demonstration of how Gelsoy could be made into a meringue resulted in the discovery of its gelling ability.

Letta I. DeVoss, a scientific aide at the Northern Regional Research Laboratory, volunteering her culinary ability for this demonstration, had prepared a Gelsoy sugar and water mixture for the demonstration according to schedule. While waiting for the late arrivals she left the mixture on the stove to keep warm. About twenty minutes later Mrs. DeVoss noted it had formed a jelly-like mass and called in one of her supervisors, the late Dr. A. C. Beckel. He took one look, shook her hand, and told her she had discovered the first known vegetable protein gel. (Mrs. DeVoss is listed as the senior inventor on the public service patent application for Gelsoy and has been presented with a Superior Service Award by Secretary of Agriculture Brannan.)

Gelsoy has found many uses. One of its first applications was as an adhesive for sealing cork liners in bottle caps. It will stick to tin, glass, wood, paper, and other materials. It has the unusual property of becoming insoluble in water upon heating. It can be used as a remoistening adhesive (to seal envelopes, for instance) and for sealing glues that will give a water-resistant bond between a variety of materials. Gelsoy adhesive would frustrate snoopers who try to open envelopes by steaming them: the heat of the steam would merely make the glue waterproof.

A 10% water solution of Gelsoy (5.5% protein) will, when heated to 190° F., form an irreversible gel. Because of its gelling and whipping qualities it can be used in ice cream, cookie fillers, candy, pudding, prepared cold meats, soups, and even as a foaming agent in fire extinguishing preparations.

Pilot plant studies to improve production techniques and further investigations of the properties and potential industrial uses of Gelsoy are in progress.

## VACUUMATIC DRIER

**Continuous high-vacuum belt drier yields superior products at favorable cost.**

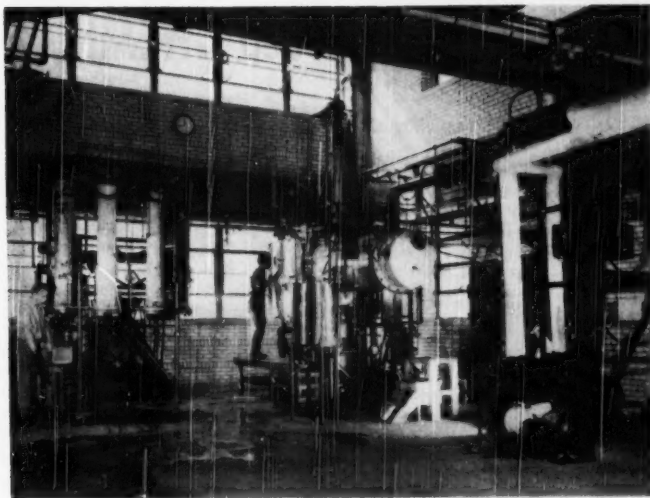
A HOUSEWIFE lucky enough to buy Holiday brand soluble coffee can give the baby the percolator for a plaything and still win a smile from her mate at breakfast. She quickly passes the word to the girl next door; he brags to the boys at the office about his wife's discovery of instant coffee that tastes like coffee. Probably neither knows that a share of the credit for this rediscovered connubial bliss should go to National Research Corp., Cambridge, Mass., for its new continuous belt vacuum drier.

The new drier is an extension of high-vacuum drying at low temperatures, which made possible large-scale production of such heat-sensitive materials as blood plasma and penicillin during the war. Two years' pilot-plant operation on coffee extract led to the marketing of the new product of improved flavor (which is sold under private labels as well as NRC's Holiday label).

Cost, at 1 mm of mercury absolute pressure, is comparable to spray drying at less than 300° F inlet gas temperature, although higher than drum drying at 25 mm. In addition to coffee, it is economical for such materials as penicillin, amino acids and milk. The dry product is of low density, porous, and instantly soluble.

### Shell and Cabinet

The belt drier consists of a jacketed round shell welded to the side of a drying cabinet. A dished head is bolted to the open end of the shell, and the cabinet has a vacuum-tight door for access to internal parts. A belt of stainless steel plates bolted to two chains moves inside the shell and cabinet. These chains pass over sprocket wheels driven through a vacuum-tight shaft seal by a motor and variable



**DRIER PILOT PLANT:** Coffee and chemicals.

speed drive. A grid of heating pipes is located between the two sections of the belt, and a spring-loaded scraper blade set against the under side removes the dried material. Above the belt a spray nozzle attached to a moving arm deposits a thin uniform film of the solution to be dried. A vacuum valve and hopper under the scraper blade remove the dried powder.

An obvious advantage of the belt drier is that the drier area is always producing. Moreover, it has a relatively high capacity since it can make efficient use of the advantages of a thin film (the thinner the film of solution, the greater the drying rate and the better the quality of the product). Heat input can be controlled along the belt to maintain a temperature gradient, an important factor in attaining maximum production. One man can operate a large unit, so labor cost is low. By controlling the concentration of the solution to be dried and the amount sprayed on a unit area of the belt, almost any desired density of product is possible, and belt capacity increases with specific volume.

Although high vacuum-low temperature dehydration is relatively expensive, cost decreases with temperature increase since greater drier capacity results. In reasonably sized plants, it quickly falls to 3 to 5 cents per pound of water removed, because of fixed labor costs and the relatively slower increase of other costs with increased size.

In the citrus fruits field, National Research has granted non-exclusive

rights under its dehydration developments to Minute Maid Corp., and an exclusive license has been granted for soluble coffee production. However, where the company's developments are not tied up by such arrangements, it will design and build royalty-free.

## ATOMIC DYEING

Uranium acetate catalyzes development of vat dyes for cotton and synthetics.

AMONG the first commercial uses of "atomic" materials is a new vat-dyeing

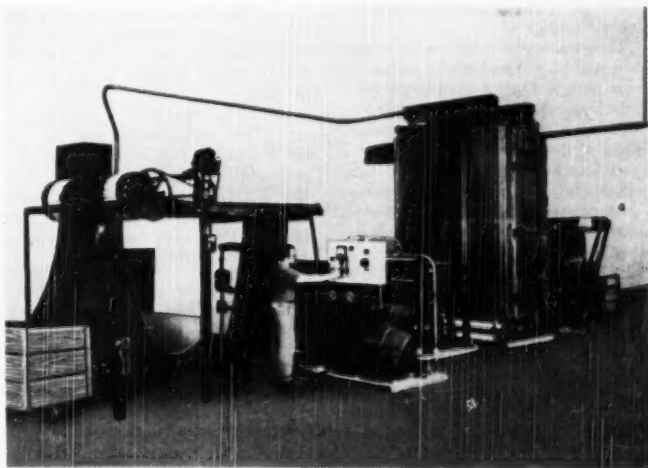
process in which uranium acetate increases the photochemical efficiency of the color-developing process by transforming light into chemical energy. The new method, developed by Vat-Craft Corp., New York, with the co-operation of the Atomic Energy Commission and several industrial firms, enables textile processors to vat-dye acetate rayon, nylon, Orlon, and other synthetics as well as cotton and viscose. Previous color-developing processes tended to deteriorate synthetic fibers, but uranium acetate, because it makes light go a long way, makes it possible to vat-dye them.

### Continuous Process

In a commercial unit now operating at the Shamrock Textile Processing Co., Paterson, N. J., a continuous process is employed. Dye and catalyst are first padded on the fabric, which is thereafter light-sensitized. In the third step the fabric is exposed to a bank of lights totaling 112,500 watts, precipitating the insoluble dye in the fabric. Washing is the fourth and final operation.

Continuous processing, made possible by the speed of the photochemical step, enables three or four workers to process 150,000 linear yards a day in two 10-hour shifts. Former batch methods required as many as 75 workers to turn out 90,000 yards in the same length of time—and space occupied by the equipment was much greater.

While the process has been tried on various textile fibers and blends, some experiments on coloring plastics indicate that the new method may be useful in that field, too.



**CONTINUOUS DYE MACHINE:** A few hot atoms, a lot of light.

# AEC's Reactor Program Will Need CHEMICAL

**PROBLEMS OF ATOMIC FUEL REPROCESSING and the possibility of a new type nuclear reactor point to increased participation of chemists and particularly chemical engineers in AEC's big new program.**

**T**HE nuclear reactors now being built or to be built soon under the Atomic Energy Commission's reactor development program are all essentially experimental. They are designed for the knowledge to be gained from their building and operation rather than for the actual use of output.

The first phase of the program is the selection and design of the initial "crop" of reactors. There are four of these. Let me name them and give their purposes, as this information will be helpful in discussing the chemical and chemical engineering problems involved. The four reactors on which attention is being focused are:

1. *Materials testing reactor*, to be used in studies of materials to be employed in building reactors;

2. *Ship propulsion reactor*, a land-based reactor designed as prototype of a unit for use in propelling submarines;

3. *Experimental breeder reactor*, for use primarily to explore possibilities of breeding, i.e., producing more fissionable material than is consumed. Will operate with high energy, or fast, neutrons;

4. *Intermediate power breeder reactor*, designed to produce electric power and explore possibilities of breeding. Will operate in intermediate energy range.

This four-reactor program crystallizes the best thinking the nation has been able to muster on reactor problems since the end of the war.

We are now entering the second phase of the reactor development program, i.e., construction. This stage will extend over a considerable period.

The experimental fast breeder reactor is farthest along. Nuclear design by the Argonne National Laboratory has been completed, and architect-engineering design work by the Austin Company of Cleveland, Ohio, is more than 90% complete. The Bechtel Corporation of San Francisco has been selected as the construction contractor. Installation of utilities, excavation

work and construction of an access road is already underway for this reactor at the nation's new Reactor Testing Station in Idaho.

The materials testing reactor, which is also to be located at the Reactor Testing Station, is following close behind. Scientific design has been completed jointly by the Argonne National Laboratory and the Oak Ridge National Laboratory. Detailed engineering design is being done currently in Pittsburgh by the Chemical Plants Division of Blaw-Knox. Construction is expected to begin in the Spring.

For the ship propulsion reactor, engineering and development work is being carried out at Argonne and at the Westinghouse Atomic Power Division on the site of the old Bettis Airport near Pittsburgh. Detailed engineering design is scheduled to begin in about a year. Construction should be underway by 1952. The reactor will be built at the Reactor Testing Station.

As to the Intermediate Power Breeder Reactor, engineering design work has been pushed to an advanced stage by the General Electric Company. The reactor is planned for construction at the West Milton, N. Y., site of the Knolls Atomic Power Laboratory near Schenectady. Preliminary site work, now underway, is expected to be completed in time for construction of major facilities to begin early in 1950.

It will be noted that of the four reactors, two are breeders and two are non-breeders. The non-breeders are pointed essentially toward power production. The breeder reactors represent a more subtle concept and one which I think will be of exceptional interest to chemical people.

## OPERATION BOOTSTRAP

The breeding process consists of the production of fissionable material in a reactor in greater amount than is used up in the fission process which keeps the reactor operating. Our hope is for the breeding of substantially more fissionable material than is consumed as fuel; hence the label "Operation Bootstrap." In spite of implica-

tions, breeding is not akin to perpetual motion, though it is almost as intriguing. The promise is that by feeding a reactor the relatively more abundant but non-fissionable U-238 it may be possible to keep the reactor almost indefinitely supplied with fuel. Yet there is no magic or mystery involved, the success of the breeding process depends directly on the extent to which we can reduce neutron losses.

Uranium happens to come in nature in two forms, differing only in atomic weight; namely, U-238 and U-235. Only the U-235 is fissionable. By the fission of U-235 in a reactor containing both U-235 and U-238, excess neutrons released in the fission of U-235 may be captured by the U-238 and, as a result of the capture, convert U-238 into the fissionable new element, plutonium.

This is the process of the Hanford reactors. The important point is that less plutonium is formed than there was U-235 in the first place. In other words, in the Hanford reactors, there is a net loss of fissionable material. Only part of the energy originally available in the U-235 ends up in plutonium which can be used for bombs or other purposes; the rest of the energy is wasted.

Now, in each fission process between 2 and 3 neutrons are emitted. One of these neutrons is required to replace the original projectile neutron and maintain the chain reaction. Another is captured by U-238 with the resultant creation of a plutonium atom. Then, we still on the average have a fraction of a neutron available to take care of leakage and losses. Such a reactor would be an ideal "converter" because, at the end of the experiment, there would be one atom of plutonium created for every atom of U-235 destroyed. However, since we are allowing a fraction of a neutron per fission for losses, if these losses could be reduced still further, we could end up with more than one fissionable plutonium atom for each fissionable U-235 atom. That would put "profit" into the operation.

We are still dealing with a converter, however, for we are converting from U-235 to plutonium. Ultimately we will get enough plutonium to build a new reactor using this element as a fuel. Now the real breeding process can start. Beginning with a given amount of fissionable plutonium, if we

This article is condensed from a talk "Current Status and Problems of the Atomic Energy Commission's Reactor Program" given by the author before the 42nd annual meeting of the American Institute of Chemical Engineers, Pittsburgh, Pa., Dec. 6, 1949.

# ENGINEERS

produce more plutonium than we use up, the longer we run the more plutonium we will find in the reactor, as long as—and this is the important point—there is an adequate reserve supply of the non-fissionable U-238 available. This is certainly not perpetual motion. We are merely converting unusable U-238 into usable fissionable plutonium. However, this is no mean achievement, for the supply of U-238 is 140 times as great as that of U-235. The rate of augmentation of our supply promises to be very slow at best, but we are increasing the potentially available supply of fissionable material by a factor of 140. This is a goal worth shooting at.

## THE CHEMICAL PROBLEM

Our difficulties are not over, however, if in the reactor itself the breeding process is successful. There remains the problem of reprocessing the fuel elements themselves. Fission products, radioactive elements in the neighborhood of barium in the periodic table, are formed in the fission process. These are the ashes of the reaction which, in sufficient accumulation, tend to smother the fire. Every so often the fuel elements must be removed from the reactor, chemically purified to remove fission products, refabricated and re-inserted into the reactor. The losses in this chemical processing are just as effective in reducing our "profit" as the losses of the neutrons themselves. The key question, therefore, is: Can the total losses, both of neutrons and in chemical processing, be kept sufficiently low so that in a complete cycle there is a net gain?

Here is where the chemical engineer comes in, and here, I would say, we are getting a glimpse of the nature of a new front opening up in the campaign for reactor development. The problem of fuel reprocessing is an enormous one, and it is almost entirely a chemical engineering problem. The cost of this processing is so high that, even if all other costs in the reactor business were kept low, it alone might keep power derived from nuclear reactors from competing economically with other fuels. It pains me as an engineer to see carefully fabricated and machined parts, products of many man-hours of highly skilled work, casually dissolved in acid to start the chemical purification. This procedure is even more painful to chemical engineers, so



by **LAWRENCE R. HAFSTAD** DIRECTOR OF REACTOR DEVELOPMENT, U. S. ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.

"Unless the breeding of new fuel becomes successful, the probability of civilian use of atomic power is dim. The difficulties we face are clearly large . . . And they are not over if in the reactor itself the breeding process is successful. There remains the problem of reprocessing the fuel elements to remove the fission products, the ashes of the reaction. Here is where the chemical engineer comes in. And here we are getting a glimpse of the nature of a new front opening up in the campaign for reactor development."

they have been suggesting reactor designs in which the laborious fuel element fabrication step can be eliminated either by placing the fuel in a solution or by utilizing techniques of transporting fluidized solids.

From such thinking there emerges the possibility of a new kind of reactor called the homogeneous reactor. All reactors constructed so far, except for one small experimental unit, have been built upon the principle of embedding fuel elements in other materials used for cooling, reflecting, and moderating. The question has been studied and restudied from time to time to see whether it would be feasible and practicable to make a reactor in which these constituents are mixed together uniformly; hence the term "homogeneous reactor."

The homogeneous reactor, in its various conceivable forms, opens up entirely new vistas and areas of development in the field of reactor design. It is my belief that with experience from the first four reactors under our belts we should be in a position to attack this difficult new design. This new type will constitute a large part of the next crop of reactors. Obviously, chemical engineering must contribute heavily.

**EDITOR'S NOTE:** Coincidental with the delivery of this talk on Dec. 6, Mr. Hafstad announced that Professor George Granger Brown, chairman of the Department of Chemical and Metallurgical Engineering, University of Michigan, has been appointed Director of Engineering in the Division of Reactor Development, Atomic Energy Commission, on a leave of absence from his University.



# ENZYME TECHNOLOGY:

MANY INDUSTRIAL CHEMICAL PROCESSES employ enzymes, and continued development points to even broader use. Better understanding of enzyme reactions and better methods for isolation of enzyme systems are required for general enzymatic synthesis of food and chemicals.

**E**NZYMES, the biocatalysts that regulate chemical reactions in living organisms, are used industrially in fermentations, where enzymes of a living microorganism produce a commercially important metabolic product. The use of yeast in the production of ethyl alcohol, and of bacteria and fungi in the production of cheeses, are examples that date from before the age of scientific investigation. More recent examples are the production of antibiotics, acetone and butanol by microorganisms. Many interdependent enzyme reactions are usually involved, and the present state of the art does not permit the enzymatic production of the end products outside of the living cell.

Industrial enzymes are commercial preparations in which an enzyme-active material has been separated from the bulk of animal and vegetable tissue or from the microorganisms in which it was contained. The reactions that can be catalyzed with such enzyme systems are usually not as complex as those in the living cell, and industrial applications are mostly restricted to the breakdown of proteins, starches, and pectin by hydrolytic processes.

In the future it may become possible to attempt the enzymatic synthesis of many compounds which are now available as fermentation end products. This will depend on a better understanding of the enzyme reactions of the living cell and on the development of better methods for the isolation of the enzyme systems. Attempts in this direction include the biological synthesis of polysaccharides,<sup>1</sup> the enzymatic synthesis of polypeptides by trypsin and papain<sup>2</sup>; and the industrial biosynthesis of fats.<sup>3</sup>

It is expedient to discuss industrial enzymes according to industrial applications rather than according to the nature of the enzyme systems. The principal enzymes which will be discussed are those from the pancreas and gastro-intestinal tract of cattle or pigs: trypsin, pepsin, rennin; vegetable

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proteases: papain, ficin, bromelin; a vegetable diastase: malt; as well as a variety of enzymes from fungi and bacteria. Main emphasis will be placed on enzymes from microbiological sources since the industrial production and application of enzymes from animal or vegetable sources is much older and has been treated extensively in the literature. (A recent book<sup>4</sup> deals exhaustively with the technology of enzymes and it should be consulted for history and literature references.) Here will be reviewed the more important applications which are in commercial use or promise to become useful in the near future, as revealed in the more recent literature.

Enzymes, acids, or alkalis can be used in almost all applications involving the hydrolysis of natural polymeric materials. Enzymes are used in cases in which the non-specific action of acids will hydrolyze constituents which should be preserved or in which undesirable side reactions occur. For instance, diastatic enzymes are used in the desizing of textile fibers because of the harmful action of acids on the fiber itself. The occurrence of side reactions prevents the use of acids in the hydrolysis of corn mash to fermentable sugars where 100% conversion is desired.

## ENZYME PRODUCTION

The enzymes of actively growing fungi and bacteria are generally excreted into the surrounding culture medium. The procedure for the production of enzyme-active preparations consists therefore in growing the suitable organism in a liquid or moist solid medium. After an active growth period from 20 to 60 hours the solid medium is extracted with water or aqueous salt solutions and filtered to remove the generating organism

(liquid media are filtered directly). The enzyme-active preparations are then precipitated from the filtered solutions by solvents such as acetone, isopropyl alcohol, ethanol, or methanol, or by salts such as ammonium sulfate. The material is dried, ground and mixed with an inert ingredient—sugar, starch, diatomaceous earth or wood flour—which serves as standardizing agent, carrier, and frequently as diluent of the active preparation.

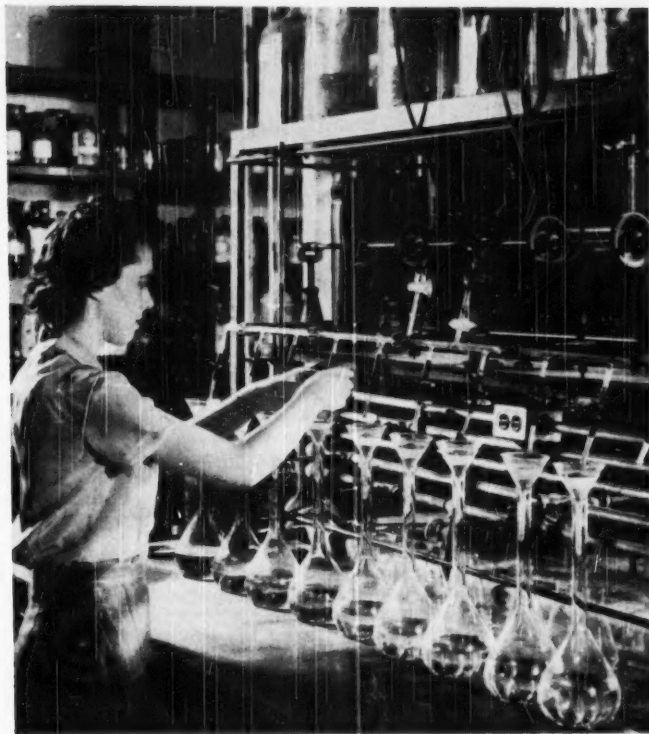
Preparation of diastases from mold grown in surface culture (tray culture on moist solid medium) has recently been studied,<sup>4</sup> as has the extraction, concentration and purification of such fungal diastases.<sup>5</sup>

Production of enzymes in liquid media has the advantage of smaller space requirements and easier maintenance of pure culture conditions. However, there have been considerable difficulties in growing fungi with heavy mycelia in submerged culture, mainly because of the problem of supplying sufficient oxygen to the viscous liquid medium. This problem has been attacked in the production of amylase by *Aspergillus Niger* when grown in submerged culture,<sup>6</sup> and in the patented preparation of starch-hydrolyzing enzymes with *aspergilli*.<sup>7</sup>

If the enzyme is contained within the cell walls of the generating organism and is not excreted into the medium, it is necessary to plasmolyze the cells prior to extraction. The preparation of invertase from yeast requires the rupture of the cell wall by autolysis or by the use of plasmolyzing agents such as amyl alcohol or ethyl acetate.

The alcohol-precipitated and dried enzyme material is generally used without further purification. It may contain some inert protein or other alcohol-coagulable material which has been extracted from the organism or nutrient medium, as well as some inorganic salts. The desired enzymatic activity is obtained by proper choice of the organism, the nutrient medium,

# A Process Frontier



After the organism grows from 20 to 60 hours, the medium is extracted and filtered.

and of time and temperature conditions of growth. However, in almost all cases there will be admixtures with the desired enzyme system of other enzyme systems which have been extracted and precipitated. This does not interfere with many industrial applications. In converting starch for the paper industry, for instance, there is no objection to the presence of proteolytic enzymes in diastases. In some cases undesirable enzymes have to be separated or destroyed to permit industrial usage. The inactivation or removal of some portion of the proteolytic enzymes from diastases is required for application in the baking industry.<sup>8</sup>

Preparations in which no attempt has been made to separate the generating organism may be called crude industrial enzymes. They are obtained by drying the entire culture. The com-

mercial mold bran preparations are in this category.<sup>9</sup>

## PAPER

Starch derivatives are used extensively in paper sizing and paper coating. The high-molecular-weight dextrans which are desired for this application can be obtained by acid or enzymatic hydrolysis of starch, or by heating (pyrodextrans). Enzyme conversion of starch by the paper manufacturer seems to be the most economical way of starch modification, but requires good control over the conversion process.<sup>10</sup> Conversions are carried out at starch concentrations of 10-25% for later use in tub sizing and off-the-machine coating. For machine-coating application the starch concentration during conversion may be as high as 50%. Even the high solids coatings may be enzyme converted in

the presence or absence of the pigments, but require relatively higher concentrations of diastatic enzymes.

The paper industry uses bacterial, fungal and malt diastases. Tapioca starch, which was widely used before the last war, has a gelatinization temperature of 145-147° F. and malt and fungal enzymes were satisfactory for conversion. Corn starch has now largely replaced tapioca starch. It has a gelatinization temperature of 158-160° F. and enzymes of greater heat stability are required for its conversion. Bacterial diastases—and to a lesser extent malt—are now used with corn starch. Bacterial diastases contain mainly an alpha-amylase (liquefying principle) and are best suited to this purpose.

## TEXTILES

Textile fibers are commonly sized prior to spinning to increase tensile strength and improve handling properties. This sizing must be removed before bleaching, printing, or dyeing.

Diastatic enzymes are in general use in the solubilization of warp sizes. They will not injure the fiber even if used in excess. The development of relatively heat-stable bacterial diastases permits starch solubilization within shorter periods at temperatures up to 180° F. as in jig, kier, or kettle applications. In addition, their high temperature stability has permitted the development of a continuous scouring and bleaching operation.<sup>11</sup>

Greige fabrics from filament viscose and acetate rayon as well as other synthetic fabrics are often sized with glue, casein or other proteinaceous material. Such warp sizes can be readily solubilized with proteolytic enzymes.

Commercial diastatic preparations for use in the textile industry have been described.<sup>12</sup> They can be tested by approximating commercial conditions with analytical immersion and padding methods.<sup>13</sup>

Enzyme-converted starches are competitive with dextrans and thin boiling starches for the finishing of cotton goods. Proteolytic enzymes may be used in producing non-felting wool; however, felting properties are not entirely lost unless the wool loses from 1-3% of its weight.<sup>14</sup> Use of papain and trypsin together with sodium bisulfite results, it is claimed, in a more durable bleach in the production of non-felting wool.<sup>15</sup>

## LEATHER

Industrial enzymes have been used commercially in the bating of hides as a result of the pioneering work of Wood and Röhm. Enzymatic bates

are used on light skins and to a smaller extent on heavy skins. Pancreatic, fungal and bacterial proteases are the principal sources for commercial bates.

Enzyme bating gives a silky, smooth grain and a desirable feel to the leather which cannot be obtained by other means. These qualities are readily evaluated by those skilled in the art but cannot be defined by quantitative measurements. It is even difficult to detect such changes microscopically.

The effect of bating enzymes on the different tissue constituents has been studied extensively. A critical evaluation of modern bating theories was published by Anderson, who worked with trypsin, papain and bacterial proteases.<sup>16</sup> According to McLaughlin and Theis<sup>17</sup> the proteolytic enzymes hydrolyze the interfibrillary protein. They believe that this has been reasonably well established but do not exclude additional effects on other tissue components. Bogaert<sup>18</sup> reports that the action of proteolytic enzymes defibrillates part of the collagen and all of the elastic fibers and that it eliminates conjunctive tissue cells.

The action of bating enzymes is frequently tested with casein or gelatin. This does not correlate well with their effect in the commercial bating process, and standardized tests on commercial skins have been used.<sup>19, 20</sup>

#### ALCOHOLIC FERMENTATION

Commercial mold brans are crude diastases obtained by growing fungi on mold bran and drying of the entire medium including the fungal mycelium. An evaluation of the performance of commercial mold brans for the saccharification of fermentation mash has been published.<sup>21</sup> Similar preparations have been used commercially in the production of commercial and beverage alcohol from grains, potatoes and other starchy materials.

The need for enzymes with less bacterial contamination than commonly found in mold brans or malt has stimulated further developments in this field. For the development of continuous fermentation processes, sterile preparations or those obtained from pure cultures of microorganisms are required. The preparation of amylases by submerged mold growth under pure culture conditions has already been mentioned. It has been used as a saccharifying agent in grain alcohol fermentations.<sup>22</sup>

#### BAKING

Proteolytic enzymes such as papain, ficin, and fungal proteases are used occasionally in modifying the wheat gluten of very strong flours, thus correcting a dough condition referred to as "bucky" doughs.

A review of the natural amylases of wheat and their significance in the milling and baking technology has been published.<sup>23</sup> It is common practice to fortify bread flour with malted wheat or malted barley flours. Recent research has shown that fungal amylases can be substituted for malt with several important advantages. The use of such fungal diastases results in greater gas production, better crust color, and improved toasting quality.<sup>25</sup> High levels of fungal alpha amylase and a reduction of the adventitious proteolytic activity are desirable.<sup>24</sup>

#### FRUIT AND WINE

Pectic enzymes (pectinases and pectases) from microbiological sources are used in fruit juices and wine for clarification. After the removal (hydrolysis) of pectin, which acts as a protective colloid, the insoluble solids and coagulable materials flocculate, and subsequent filtration produces a clear juice or wine. Pectic enzymes are used commercially in the processing of apple juices and other clarified juices<sup>26</sup> and fruit juice concentrates. Apple juice may be concentrated to 40-50 Brix without pectin hydrolysis, but the commercial concentrate of 70-75 Brix requires hydrolysis with pectic enzymes prior to concentration. A similar degrading of pectin is required for the production of solid candies from citrus juices. Pectic enzymes are also used abroad and in this country to aid in the clarification of grape and fruit wines.<sup>27, 28</sup>

Alfalfa, tomatoes, eggplant and other vegetables as well as some microorganisms are good sources of pectin esterase. This enzyme is useful for the preparation of low methoxyl pectins by hydrolysis of the methyl esters which are part of the pectin molecule. The effect of methyl ester content upon the gel characteristics of pectins has been described<sup>29</sup> and it is believed that low methoxyl pectins will find wider acceptance in the food industry, mainly in the preparation of gels of low sugar content. Partial de-esterification of pectin by pectin esterases leads to slow set pectins which are desirable in the manufacture of candy gels with 70-80% sugar content.

Methods for the analysis of the main pectic enzymes are available.<sup>30, 31</sup>

#### CHOCOLATE

Some manufacturers use diastatic enzymes to reduce the viscosity of chocolate sirups which contain appreciable concentrations of cocoa starch.

Candies with liquid centers (for instance, liquid cherry candies) are made with a semi-solid sugar solution to which the enzyme invertase (sucrase) has been added.<sup>32</sup> Hydrolysis of sugar

to the more soluble glucose and fructose produces the liquid center. Invertase also has the advantage of producing invert sugar without increasing its ash content.

#### BREWING

The diastatic activity of properly malted barley is more than sufficient to saccharify brewers' mash. Additional diastatic enzymes from microbiological sources are used occasionally when natural barley enzymes have been inactivated or when relatively large concentrations of rice or corn are used as brewers' adjuncts.

The use of proteolytic enzymes to chill-proof beers is a general commercial procedure. The enzymes will degrade proteins which cause the chill haze of beers (particularly protein tannin complexes), but foaming of beer is impaired if hydrolysis is carried too far.

The use of proteolytic enzymes for chill-proofing was disclosed as early as 1911.<sup>33</sup> Papain, pepsin, and combinations of these plant proteases with fungal enzymes are in commercial use. The composition of chill hazes has been investigated<sup>34</sup> but the proteolytic process is not sufficiently understood, so that chill-proofing enzymes are commonly tested with beer and ale as substrates.

#### CHEESE

The trend toward the use of pasteurized milk in the production of cheese has stimulated new investigations of the role of enzymes during the ripening process. The lipase in raw milk plays an important part in the flavor development of blue cheese, but lipases isolated from microorganisms may be used for the production of cheeses from pasteurized milk.<sup>35</sup>

The softening of cheese curd during ripening is principally due to proteolytic enzymes. The use of pancreatic and other proteases for accelerating the ripening of cheeses has been patented.<sup>36</sup>

#### MEDICINE

The use of diastatic and proteolytic enzymes to compensate for natural deficiencies of digestive enzymes is well known. Papain, pancreatic or fungal diastases or proteases are given orally. After surgical removal of the stomach, the duodenum, or the pancreas such compensation is often needed.<sup>37</sup> Pancreatic lipases are also used to increase fat absorption. Some of the medical and cosmetic applications of papain have been recently reviewed.<sup>38</sup>

Mucolytic enzymes, particularly hyaluronidase, are now being studied.

(Turn to page 138)

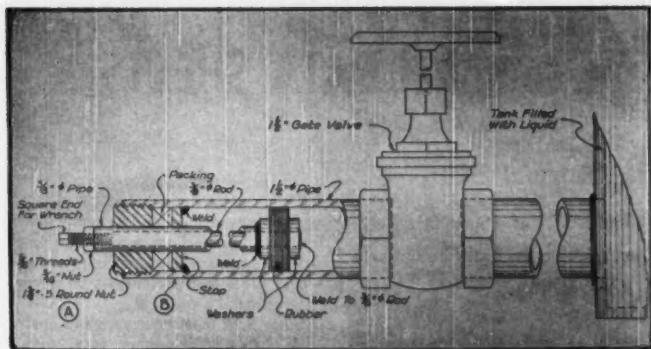


Fig. 1—Detail of stuffing box and plug assembly for sealing off pipe between valve and tank.

## How to Change a Valve on a Full Tank

by ELTON STERRETT, Houston, Texas

**SIMPLE PLUG DISK AND STUFFING BOX assembly permits changing gate valve at bottom of full tank without emptying tank.**

**T**HE situation arises fairly often in chemical processing plants where an outlet valve must be replaced or another outlet valve installed on a full tank. The usual procedure has been to empty the tank. If it contained flammable material, and the new connection was to be welded, the tank had to be purged as well.

All this is expensive and time-consuming. If gate valves are involved, however, the following methods may prove it is not always necessary. In such cases the following methods may prove to be simpler and quicker:

### CHANGING OUTLET VALVE

To change a gate valve rapidly, without emptying the tank, a special plugging nipple as shown in Fig. 1 may be used. The nipple assembly illustrated is for a 1 1/2-in. valve, but the principle may be adapted to any size fitting.

An ordinary pipe nipple, of a size corresponding to the size of the valve connection, is lightly reamed to give a smooth inner surface. Inside the nipple a steel disk B is seal-welded to form a bottom against which packing is compressed, while a threaded plug A serves as the packing gland. Through the center of this packing assembly runs a smaller pipe, 3/8-in. in the case of the illustration, with a 1/2-in. nut welded across the outer end. Inside

this is a rod threaded at one end to fit the 1/2-in. nut and welded at the other end to a disk smaller than the inside diameter of the nipple. Between this disk and a collar on the end of the 3/8-in. pipe is a rubber plug. The plug can be compressed by holding the pipe and turning the end of the rod with a wrench.

To cut off the tank contents behind the valve to be replaced, the line leading from the valve away from the tank is disconnected and the nipple assembly screwed into the valve in its place. The valve is then opened fully and the rubber plug pushed through the valve opening until it is between valve and tank. The packing in the nipple serves to retain the contents of the tank during this operation. By turning the rod to compress the plug, the diameter of the plug increases and a tight seal is formed. Release

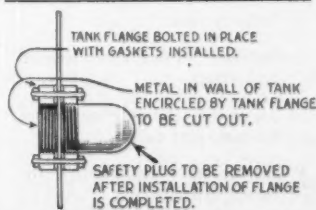


Fig. 2—Bull plug seals flange opening.

of the packing within the nipple allows that member to be unscrewed from the valve without disturbing the plug. The valve is then removed and the new valve substituted.

Replacement of the nipple over the plug-tightening assembly permits withdrawal of the plug through the valve. Valve closure and line replacement complete the operation.

### WHERE THERE IS A VAPOR HAZARD

A similar method can be used for welding pipelines or replacing gate valves on tanks which have been emptied of volatile flammable liquids but which have not been purged.

A rubber plug is placed between a metal disk carrying a nut and another through which a threaded bolt passes. The plug is forced through the end of the line to be worked on, or through the gate valve. The bolt is tightened with a forked or hooked bar, and the valve replaced or welding done without danger of flame traveling through the pipe or of vapors escaping. When the repair is complete the disk assembly is removed and the valve closed or pipeline re-connected.

### ADDING AN OUTLET VALVE

Delay in receipt of valves and fittings for connecting two new tanks can sometimes make it necessary to put the first tank into service and then tie the two together later.

This tie-in can be accomplished without emptying the tank in service by bolting a pair of companion flanges to this tank at the point where the connection line will be located. The tank wall except for the ring of holes for the companion flange bolts is left intact as protection against leakage.

For safety a bull plug is screwed into the inner flange, then tightened to withstand the liquid pressure within the tank (Fig. 2). This seals off the flange opening. A cross of steel rods is welded inside this plug to afford purchase for a forked rod wrench to remove the plug.

When it is desired to connect the two tanks, the wall of the tank in service is cut through with a torch at the point inside the companion flanges, the contents of the tank being protected by the bull plug. A nipple is screwed into the outside companion flange, and a gate valve attached. Then, through a stuffing box similar to the one used for the outlet valve replacement, a rod wrench is used to back out the bull plug, which is allowed to fall to the bottom of the tank. The gate valve is closed after the rod wrench is pulled back. Finally, the stuffing-box unit is removed and the tank tied in without a moment's loss from service.

# How to Prepare Technical DATA SHEETS

by M. H. BAKER, Chemical Department, Field Application Section  
General Mills, Inc., Minneapolis, Minnesota.

**THE DATA SHEET IS THE "BIRTH CERTIFICATE" of a new chemical product. Careful attention to its preparation can give the "baby" a better start in its commercial life.**

A DATA SHEET can be your best salesman—or your worst enemy. It can collect dust in your potential customer's filing cabinet; or it can help fill his wastebasket. But at its best it can tickle his curiosity and fan his first flicker of interest into the flame of action. It can be an effective tool, for it deals with the basic requirements of introducing a new product: the properties of the new material and how these properties may be applied.

Determination of a new chemical compound's properties usually begins in the research laboratory. As the product begins to show increasing indication of value in one or more fields of application, the laboratory submits its data, together with small samples of the product, to the applied research organization, engineering department, and the marketing research and commercial chemical development organizations.

The applied research specialists then determine whether or not the known properties of the material will enable it to serve either alone or in combination with other chemicals in some industrial operation or possibly some consumer product.

Once the applied research organization, which is pivotal in the development of a new chemical product, has indicated that the material may have a place in industry, the engineers begin to determine whether or not it can be manufactured economically from available raw materials. And at the same time, the chemical marketing research department, armed with some pre-knowledge of engineering cost figures, studies the indicated fields of application, determining the potential volume of business these applications offer. Market research will, of course, include determination of the price level of possible competitive products as well as studies of many other factors influencing the product and its possible markets.

Meanwhile, the commercial chemical development organization will be listing, analyzing and organizing data in preparation for the time when the new

material is ready for introduction to its possible users. This is the beginning of the data sheet.

## BIRTH CERTIFICATE

The data sheet for a new chemical product is virtually a "birth certificate." It shows that the product has been judged suitable for sampling and discussion outside of the organization which developed it. Since it represents the product's first contact with the outside world, its contents, its style, and its format deserve careful consideration.

Giving a data sheet consideration, however, does not mean burying it beneath a mound of uncertainty. Often the issuance of data sheets is delayed on the grounds that "there is a great deal we still do not know about this product." Invariably there is some information which is still being developed when a data sheet is being contemplated, but this fact should never deter the commercial chemical development organization from organizing and solidifying its data and presenting it in

attractive form. If industry had waited for "required" data on all its new products, it would never have produced a data sheet and possibly would never have released a product.

Since it is true, however, that some "hot" data usually appears about three days or a week after a new data sheet is ready for release, it is nearly always logical to produce as few copies of the sheet as possible—usually enough to cover only a month's requirements. As development work progresses, it is always possible to reissue the data sheet in revised form. It is also possible to issue bulletins that supplement the original data sheet and keep it constantly "alive" and up to date.

The method of reproducing the data sheet is also important. Although printed brochures are usually the most attractive, they are also the most expensive and the least flexible. Most organizations, therefore, multilith or mimeograph their data sheets.

The usual format for a data sheet is 8½" x 11" (letterhead size), the top sheet being printed with an attention-attracting letterhead in contrasting colors. The heading, of course, should name the company that produces the material and should point out that the contents of the bulletin describe a new product.

The rest of the top page contains the name of the product and begins to list data describing it; as many additional pages are added as are necessary. All of the individual sheets are stapled or clipped together to form a single bulletin. (Some companies, as a variation of this general system, use the first sheet as a printed cover page which names the product and its producer and gives other general information helpful in understanding the data that follows.)

## CONTENT IMPORTANT

Since a data sheet is primarily a source of information, its content is even more important than its format and general appearance. What, then, must a sound data sheet contain? Generally, it should begin with the name of the compound prominently displayed. If the product has a long chemical name and a shorter designation, it is advisable that both be shown in the heading; e.g., 2,2,6,6-tetramethylcyclohexanol (TMC). By listing the

## YOUR DATA SHEET SHOULD CONTAIN . . .

1. Name of company and product.
2. Date of issue.
3. Availability of samples, prices.
4. Description and formula of product.
5. Possible uses.
6. Detailed physical and chemical properties.
7. Suggested formulations and technological data.
8. Waiver of responsibility for patent infringement.



RESEARCH LABORATORIES  
2010 East Hennepin Ave., Minneapolis 13, Minnesota

NEW PRODUCTS COMMERCIAL RESEARCH  
Chemical Department  
Field Application Section

(c)  
March 2, 1949

### 2,2,6,6-Tetramethylcyclohexanol (TMC)

INQUIRIES FOR SAMPLES, further data, etc. are invited and should be addressed to K. H. Baker, Chemical Field Application Section; General Mills, Inc.; Research Department; 2010 East Hennepin Avenue; Minneapolis 13, Minnesota.

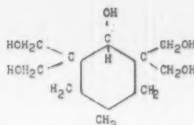
SAMPLE QUANTITIES of one and five pounds are available on a no charge basis, and additional quantities are available for cooperative evaluation research projects. Samples of TMC rosin esters and TMC fatty acid esters are also available in limited quantity for evaluation in varnishes, lacquers and paints.

THE COMMERCIAL PRICE OF TMC, as estimated, will ultimately be competitive to materials in current use for similar purposes.

#### DESCRIPTION:

2,2,6,6-Tetramethylcyclohexanol (TMC) is a low melting pentahydric alcohol with four primary hydroxyl groups and one secondary hydroxyl group. In practice, it has been found that about 90% of the OH groups are available for esterification. The cyclic hydrocarbon chain has proved to be a valuable source of internal plasticization and adhesion in the final compositions.

#### FORMULA:



#### SUGGESTED USES FOR TMC:

The five hydroxyl groups of TMC present numerous opportunities for valuable chemical formulation.

1. Synthetic drying oils resulting from the esterification of TMC with unsaturated acids possess excellent properties which will be indicated below. Of primary interest is their hardness. Reconstituted soybean or linseed esters may be directed to -
  - a. House Paint
  - b. Porch and Deck Paint and similar paint compositions
  - c. Diluents for alkyd resins.

First page of a data sheet. Suggested uses occupy an additional page, properties a half page, and an outline of technology the remaining eight and a half pages.

product's nickname or generic designation as well as its chemical name, the data sheet makes it easy for both technical and non-technical readers to identify it in correspondence.

In the heading or near it, the data sheet should also include its issue date and, if it is a revision of an earlier sheet, a number or letter which will serve as a reference. Immediately under the heading there should normally be a statement announcing the availability of samples, describing the types of samples available and telling how they may be obtained. Next should come some information about the price of the product.

All preliminary data of this type should be presented in a very brief form on the first page and, if necessary, repeated in expanded form later in the data sheet. Generally speaking, it should not take up more than one-third of the available space on the front page. Immediately after it there should be a description of the product; but this description, too, must be in ab-

stract form and may be expanded elsewhere in the data sheet when necessary. If the new product is an organic chemical, the initial page should also show a structural formula immediately following the product description.

If there is still space after this information is listed (and there usually is), suggested uses and possible applications for the new product should be itemized briefly. Each use or application should be followed by a statement explaining and justifying its potential. Formulation information should not appear at this point.

After the applications should be listed the properties of the material in complete detail, including such physical properties as viscosity, color, drying times, moisture content, typical analysis, melting point, solubilities and compatibilities. If solubility and compatibility data is voluminous, it may be indicated by general statements at this point and tabulated farther on in the data sheet.

A review of chemical reactions may

follow the listing of properties, particularly if the product is a fine organic chemical. Usually, however, suggested formulations will prove more interesting at this point.

#### LOGICAL ARRANGEMENT

This general arrangement of material is easy to follow because it is logical. It forms a continuous narrative description of the product, telling what the product is like, what its suggested applications are, its general properties, and some of the things which may be done with it.

The formulation data, of course, should be presented in as practical a manner as possible, for it must win acceptance as well as inform. It should be couched in the terminology of the industry toward which it is directed. In fact, it is frequently desirable to make two or three different data sheets, essentially the same in general content but featuring different terminology and giving different formulations, each directed toward a particular industry.

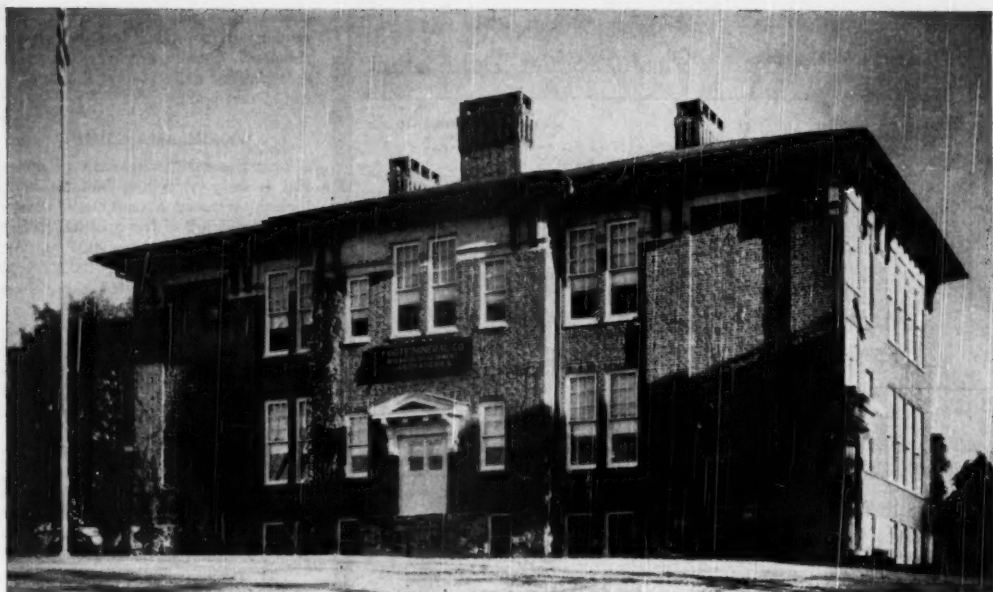
The reader who receives a data sheet of this type, written clearly and describing formulations involving materials with which he is familiar, will immediately begin to formulate in his mind possible reactions which are not covered or possible variations of the formulations included. Once he does that, he usually becomes interested in working with the product. To clarify his thinking further and to solidify it, the bulletin should immediately give him liberal technical data, tables, charts of comparison, graphs, and outlines of technology.

This section of the data sheet should include information about solubilities, compatibilities with various products, drying times, baking times, flexibility data, dispersibility data, data about insolubilization, information about resistance to various micro-organisms, electrical characteristics, viscosities and anything that will enable the reader of the data sheet to determine whether or not his own line of reasoning is applicable to the compound and that may help set his determination to evaluate the product.

Because of legal requirements the technical information should be followed by a phrase pointing out that data or formulations offered are believed reliable but must not be taken as warranties. It also may be well to mention that although the uses and formulations described are believed to be free of patent infringements, that fact cannot be guaranteed.\*

#### GOOD WRITING COUNTS

Aside from content, writing is the most important part of any data sheet.  
(Turn to page 146)



## Foote Converts Schoolhouse Into Research Laboratory

by HOWARD C. E. JOHNSON, Managing Editor

**FOOTE MINERAL COMPANY'S time- and money-saving ideas might profitably be borrowed by small chemical companies initiating research.**

**W**HEN Foote Mineral Co. decided to establish a centralized research laboratory, the first thing its officers did was to get bids for new construction. The price was high, and the promised completion date was far in the future.

They looked around. In Berwyn, Pa., a Main Line suburb of Philadelphia not too far from the company's plant at Exton, Pa., they found an unused brick schoolhouse of simple, square design with plenty of windows. They bought it, made the necessary changes in the interior arrangement, moved in equipment and furnishings, and staged an official\* opening—all within three months. And the cost was slightly less than half that of a new building.

Dr. S. C. Ogburn, Jr., director of research, pointed out that any time one could find a square building of good

construction with sufficient windows, it was cheaper to remodel than to build. The final result is not custom-tailored to the research department's needs—but often even a new building is found after a time to require changes.

Savings were also made in equipping the laboratory. Since much of Foote's research is off the beaten track, equipment is not standard. One of the busiest corners of the building, consequently, is the machine shop, where much of the equipment is made to specifications.

### GROWING COMPANY

Establishment of research facilities came about largely because Foote is becoming too large not to do research.

Now about 70 years old, Foote started out as a hobby. A. E. Foote, its founder, roamed about the country-

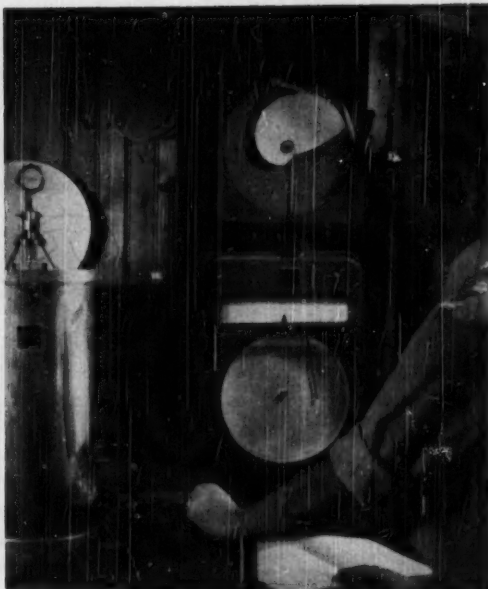
side picking up mineral specimens. Schools and museums started ordering them, and finally the orders became numerous enough and sizable enough to warrant commercialization of the hobby. Progress, both saleswise and product-wise, brought the company to a peak last year of \$3.6 million in sales, and preliminary figures indicate that 1949 was even better.

The company is still small, nevertheless, and the 2½-3% of sales ordinarily spent on research wouldn't support a very large laboratory. Foote augments this budget in two ways: by doing research for the Government on a contract basis, and by carrying out projects sponsored jointly by itself and other industrial firms. The former can lead to profitable production contracts, and the latter may produce joint profits for Foote and the sponsoring firms. In this way Foote is able to do about three times the normal amount of research.

Although Foote's interests range from welding fluxes to fractional distillations at 700°F., one thread—metals



Apparatus for rapid and accurate analysis of special alloys.



Measuring thermal expansion properties of ceramic bodies.

—holds them all together. Chief current interest is lithium and zirconium.

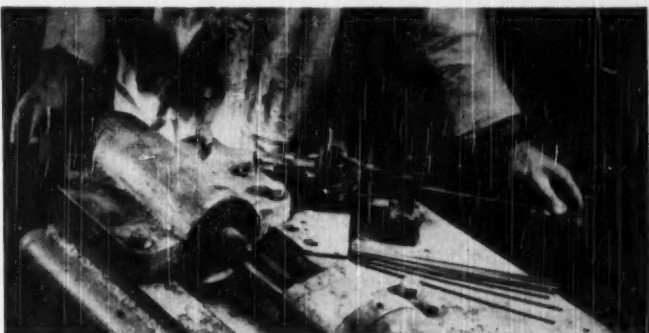
#### KEYSTONE IS METALS

Most of Foote's 200 lithium customers are ceramics manufacturers, but one new lithium chemical attracting petroleum companies' interest is lithium hydroxystearate (*CI Newsletter*, Dec. 1949), base of an all-purpose lubricating grease.

Zirconium, abundant but costly to produce, is expected to become important in some specialty uses. Presently it costs about as much per pound as titanium, but since the latter is lighter, it goes farther. Zirconium's most important use at present is military hush-hush.

Another current research project is the separation of difficult-to-separate metals by fractional distillation of their compounds. Foote has a 25', 50-plate all-glass still which operates with a 30:1 reflux ratio at temperatures up to 700°F. Foote researchers won't say what metals they're separating, but they admit that their distillation method solves problems that have bothered metallurgical chemists for decades.

Ogburn believes that the possibilities for the less-known metals and their compounds has barely been opened up. Low-cost lithium and chemicals for the steel industry are just two of the fields in which Foote hopes to reap rewards in the years ahead—and the converted Berwyn schoolhouse is expected to lend a hand.



Welding electrode extruding machine used in preparing coated wires for evaluation.

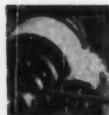


Section of the metallurgy laboratory, where lithium and zirconium are of special interest.

# CHEMICAL FILTERS

## Many Types Meet Industry's Varied Demands

by SHELBY A. MILLER  
University of Kansas, Lawrence, Kansas



**SEPARATIONS OF SOLIDS AND FLUIDS** are encountered in most chemical processing. They range from removal of impurities in liquid clarification to the separation of huge quantities of solids in metallurgical plants. The author classifies filter types available and presents a consensus of manufacturers and users on selection.

**T**HE chemical engineer responsible for plant design or operation of process plants each day encounters the problem of phase or component separation by thermal, diffusional, and mechanical means. If the mixture contains undissolved particulate solids and a fluid it is probable that mechanical means will be employed. Further, if the mixture is sufficiently fluid, utilization of a filter is probable.

Filtration is the separation of solids from a fluid in which they are suspended, the separation being accomplished by passage of the filtrate through a membrane or septum on which the solids are retained. In the broadest sense of filtration the fluid may be a liquid, a gas, or a mixture of the two; and the flow of the fluid, called the filtrate, through the septum (and through the accumulation of separated solids, called the cake) may be induced by hydrostatic head above the septum, by pressure differential maintained by a slurry or vacuum pump, compressed gas, or by centrifugal action. In actual practice, gas-solid separations and centrifugally actuated liquid-solid separations (*CI*, Sept., 1949, p. 357) are considered as distinctly different unit operations.

This discussion, like most of the others on the subject, defines filtration as the removal of solids from a mixture with one or more liquids. This is accomplished by collecting the solids on a membrane through which the liquid flows. This definition excludes not only gas clarification, centrifugation, and

thermal and diffusional solid-liquid separations, but also such mechanical operations as sedimentation, elutriation, expression (the squeezing of liquid from a wet solid), and electrophoretic concentration. A filter is any device by which filtration, so defined, is effected.

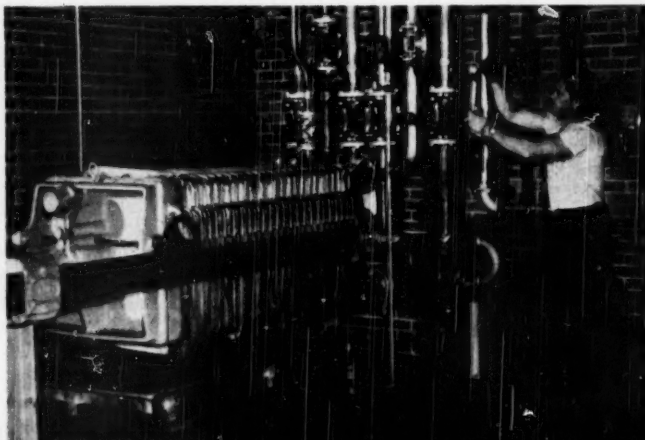
During the past thirty-odd years the theory of filtration as an application of fluid dynamics has been elaborated by Sperry (11),\* by Ruth (10), by Lewis (14), by Carman (4), by Walas (13), by Katz and Brownell (3), and by Hermans and Bredee (6). For a high-spot review of most of this theoretical work the reader is referred to summaries by Bellas (2), by Badger and McCabe (1), by Dickey and Bry-

den (5), and by Miller (8). Theory has been useful in dictating some of the gradual improvements wrought in filters and their accessories, and today it is a valuable tool in that it offers sound methods of data correlation and predicts the effect of changes in operating conditions (temperature, pressure, slurry concentration, filtrate viscosity) on filter performance. Because of the complexity of solid-liquid mixtures, however, it is still impossible successfully to design or specify a filter without broad experience with the operation, specific filtration data for the material involved, or (usually) both. For the same reason, the theoretical equations in the hands of an inexperienced engineer often become confusing and dangerous guides to operating procedure.

It is understandable, therefore, that

\* Numerals in parenthesis indicate literature references at the end of this paper. Super-script numerals indicate manufacturers listed in tables I-III.

Shriner filter press removing Darco activated carbon in the purification of Atlas sorbitol.



most practical discussions of filters have remained broad and largely descriptive, and the directions for the choice and use of filtration equipment has been only general rules. The detailed specification of a new filter usually has been delegated to a manufacturer of the equipment (many of whom are unsurpassed reputable experts) or to an expert consultant, as has the solution of difficult operating problems.

Actually it is more desirable to have a trained filtration engineer in the customer organization to specify the filter or to work cooperatively with the filter manufacturer, since such an individual will be more familiar with the details of the material and process involved. Unfortunately, however, most companies do not have such an engineer on their staffs, in which case it is wiser to rely on the equipment supplier than to depend on inexperienced judgment. In any event, it is important that supervisory, operating, and design engineers be informed of the existence and the fields of application of the various types of filters and of the general operating procedure identified with each. Expositions attempting to do this are not new; in addition to several brief reviews (1, 9, 14) an article by Irvin (7) gives detailed descriptions of a number of filters and of their areas of use, and, more recently, the monograph by Dickey and Bryden (5) gives extensive coverage of filtration equipment. The former is almost ten years old, however, and suffers from the reader's inference that certain of the filters discussed are the exclusive products of a single manufacturer or two. The latter does not identify the many types of filters listed by trade name and manufacturer. Both have omitted filters of occasional interest. The purpose of this paper is to tabulate briefly the important types of filters employed by the chemical process industries today, with allusion to their fields of use and limitations, and to mention a few of the more recent developments in filter application. Most of the information

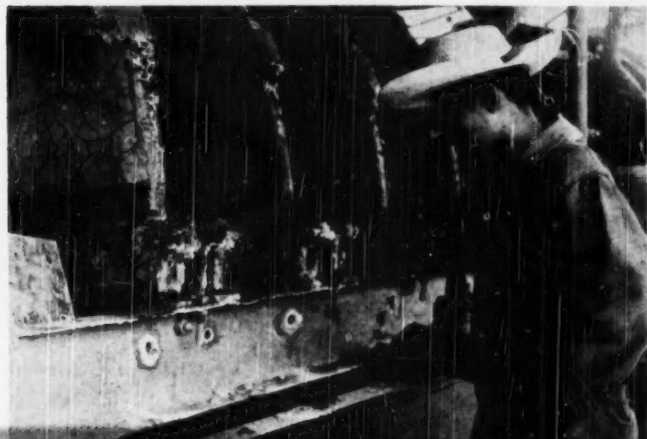
included has been derived from the general references mentioned (5, 7), from the industrial literature, from discussion with various vendors of filtration equipment, and from personal observation. Trade names have been used freely whenever they exist (in general, words in quotes are or have been protected by trade mark registration), and a partial list of representative equipment manufacturers from the author's file has been included for the reader's convenience. Neither intensive nor extensive completeness is claimed; for more detailed equipment description, the reader is directed to the general references cited and to the manufacturers' trade literature, and for filter manufacturers omitted by chance from Tables I-III he is referred to Thomas' "Register" (12).

#### CLASSIFICATION OF FILTERS

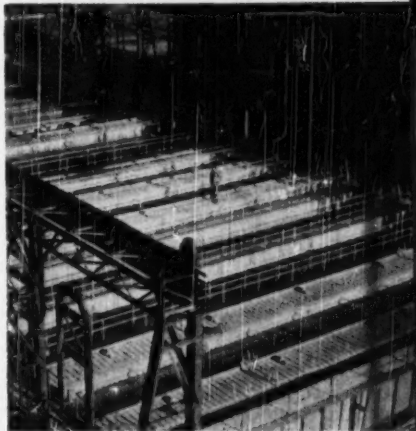
The classification to be employed here, based on the mechanism of filtration, classifies equipment as cake filters, clarifying filters, and simple strainers. Cake filters separate mixtures containing solids of such quantity and nature as to allow the formation of a distinct cake whose surface of which is the true filter medium rather than the supporting septum. They are the kind most frequently encountered in the chemical process industry. Cake filters may be either pressure or vacuum activated, and may operate continuously or intermittently. Most of the established theory has been developed for this type of filter.

Clarifying filters remove relatively small quantities of solids (usually of small particle size) from a liquid. They are employed extensively in the treatment of beverages, lubricating and fuel hydrocarbons, and pharmaceuticals. Originally all clarifying filters operated with a filter medium which acted as the true filtering surface and which gradually became blocked without the formation of appreciable cake, and to such filters the theory of Hermans and Bredee (6) applies. In recent years, however, there has been an increasing

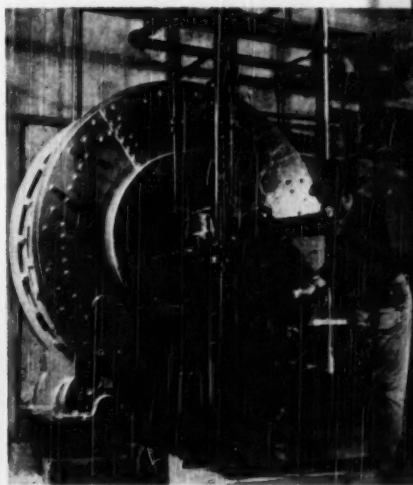
Scraper removing cake from the rotary vacuum disk filter of the Denver Equipment Company.



The Kelly filter has vertical rectangular leaves supported from one end of the shell.



Moore batch vacuum leaf filter separating magnesium hydrate for The Dow Chemical Co.



The filtering surface of the Dorcco rotary vacuum filter is on the inside of the drum.

tendency to use filteraids, as a precoat as well as a prefilter additive, to convert clarification into cake filtration. Precoat filters will be classified generally as clarifiers, nevertheless, in accordance with functional consistency. Clarifying filters are usually pressure activated, may be continuous or intermittent (usually the latter), and are best classified by the nature of the filter element.

Simple strainers are elements of wire cloth or perforated plate intended to remove small quantities of relatively large-size particles or of immiscible liquid globules from a liquid. They may be in the form of a pipe-line unit or a surface screen over which the mixture is flowed. Labyrinthine or baffled chambers which effect the desired separation by change of direction of flow are sometimes used instead of screens. In either case, the collected solids usually fall away from the strainer into sump shortly after their retention. Strainers are more important to the mechanical industries than to chemical processes, and will not be considered further.

Certain thickeners, devices which concentrate a slurry by mechanical separation of some of the liquid, are essentially partial filters, operating on the same principles as do filters. These will be considered as an additional class of filters.

## CAKE FILTRATION

### PRESSURE (INCLUDING GRAVITY) FILTERS

Pressure filters are those which operate under superatmospheric pressure at the filtering surface and atmospheric (or greater) pressure at the downstream side of the septum. The upstream pressure may be caused entirely by the hydrostatic head of the slurry awaiting filtration (so-called gravity filtration). More frequently the pressure is imposed by a pump or by compressed gas, with or without the assistance of hydrostatic pressure, to permit the application of relatively high pressure differentials (50 psi or greater). Pressure filters are nearly always batch devices; that is, the filtration must be interrupted for removal of the cake and cleaning of the filter. Unless otherwise indicated, those described below are batch filters.

### GRAVITY FILTERS

The commonest type of gravity filter is the sand- or anthracite-bed filter, strictly speaking a clarifying device used almost exclusively for water filtration. Sand filters are well standardized in design and are described in handbooks and textbooks of water works engineering. Because of lack of use for chemical process work in this

country (they have been proposed for viscose clarification in Europe), they will not be discussed further.

The chemical industry still employs quite extensively one type of gravity filter, however, the simple nutsche. A nutsche is a tank equipped with a false bottom, perforated or porous, which may support a filter medium or may itself act as the septum. A slurry contained in the nutsche is filtered through the bottom under its own hydrostatic head, the filtrate collecting in a sump beneath the filter or running to the sewer. Any cake which collects on the bottom must be scooped out, making the life of a filter fabric extremely short. The cake may be thoroughly washed by adding the desired amount of wash solvent after filtration is complete. If washing is difficult, the nutsche may be equipped with an agitator which will reslurry the cake and maintain it in suspension until sufficient diffusion and dilution of cake contaminant has occurred.

In spite of its extreme simplicity, low initial cost, and effective cake washing, the nutsche is difficult to justify for any except small-scale experimental operations. The large floor area occupied per unit of filtration area, the relatively low rates of filtration, the difficulty of keeping the surroundings clean, and the high labor charges incurred in its operation make it safe to say that all of these archaic filters should be replaced.

Nutsches usually are plant-constructed, although false bottoms of wood and ceramic nutsches may be purchased from the manufacturers of wood tanks and of chemical stoneware, respectively. If the tanks are designed accordingly, nutsches may be operated as vacuum or pressure filters.

Gravity bag filters<sup>30\*</sup> still are used occasionally for simple straining operations (e.g., the removal of lumps from paint or dirt from lubricating oil), but are not generally recommended for process filtrations.

### FILTER PRESSES 27, 48, 49, 50, 57

Perhaps the most widely used pressure filter is the filter press. These devices have been used so long and have been discussed so often that only a brief description is required. Filter presses are of two principal types, the plate-and-frame (or flush plate) filter, and the recessed-plate filter. The former consists of an assembly of alternate solid plates, the faces of which are studded or grooved to form drainage channels, and hollow frames, in which the cake is retained during filtration. The latter consists only of

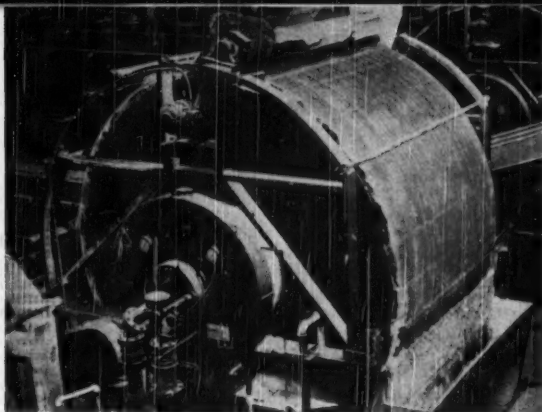
plates, both faces of which are hollowed to allow a chamber for cake accumulation. In both types, filter medium (usually a fabric) covers both faces of each plate. The plates and frames are hung in a vertical position on a pair of support bars and are compressed to a water-tight closure between two end plates, one fixed and the other movable. The plates and frames are usually rectangular, although circular or triangular plates are sometimes used. Plate-and-frame presses are fed and the filtrate is discharged through channels in the corners of the plates and frames or in lugs projecting from the sides of the plate or frame. The latter arrangement eliminates the channel holes in the filter cloth, which are often a source of difficulty because of leakage which is likely to occur despite use of lug gaskets. Recessed-plate presses must be fed through an internal channel, usually in the center of each plate.

Filter presses are made in plate sizes ranging from 6" x 6" to 61" x 71". Frame thickness ranges from practically zero (using frames with panels) to 8". Presses are made of wood, hard rubber, plastics, and various metals. Depending on the construction, they may operate at pressures up to 1000 psi. The plates may be cored for steam heating or for refrigerant circulation.

The filter press has many advantages, the greatest of which are its simplicity, inexpensiveness, flexibility, and ability to operate at high pressures. The floor space and headroom requirements per unit of filter capacity are very small. It is possible to reduce the capacity of a given press by removing frames or inserting a blank-off plate and longer support bars can be purchased to increase the capacity. The press may be cleaned relatively easily, and the filter medium is easily removed and replaced. By the use of open discharge with individual cocks each plate can be watched and controlled independently. A cloudy discharge indicates a break in the cloth. The cock can then be closed to blank off the plate. With proper operation, a denser, drier cake will result than from almost any other filter.

Offsetting these advantages are certain serious disadvantages. It is difficult to wash a cake thoroughly, even in a press equipped with washing channels to permit "thorough washing," for the cake is almost always of variable density. In a simple press, in which the wash water takes the same path as the slurry and filtrate, washing is next to impossible, particularly if the frame has been allowed to fill to a hard cake. In one plant, for example, wash water was pumped through a press for 48 hours after

\* Superscript numerals indicate manufacturers listed in tables I-III. Numerals in parenthesis indicate literature references at the end of this paper.



Continuous rotary vacuum drum filter separating precipitated calcium carbonate for Wyandotte Chemicals Corporation, Wyandotte, Michigan.



The screen-covered vertical leaves of Blackburn-Smith precoat pressure filter are suspended in a horizontal cylindrical shell.

each filtration in order to remove enough solute from the cake. Filter fabric life is relatively short because of the mechanical wear incidental to emptying and cleaning the press, sometimes involving scraping the cloths with a spatula or a paddle. Cloth failure is particularly rapid in a recessed-plate press. Labor charges are high, since each frame must be handled separately and each cloth inspected. Presses often leak and drip, making housekeeping in the area a problem.

Many of the disadvantages can be eliminated or reduced by proper operation to permit exploitation of the attractive features of the filter press. For example, washing may be made more effective not only by the installation of "three-button" (wash) plates to permit thorough washing, but by venting the wash-feed plates to assure that the water reaches the top of the cake and by arranging the press so that wash water discharge is from the top of the plate. Cloth wear can be minimized by the choice of heavy, tight fabrics (preferably ducks or chains), by elimination of sharp edges on the plates, and by use of smooth wooden paddles to scrape the cloth. Although the filter press is inherently a labor-expensive device, expense can be reduced by mechanical plate retractors and frame jacks.<sup>50</sup> These lift the frame above the press to allow the operator to spatula the cake from it. With such devices, female operators are able to handle a filter press; in one process it is reported that two girls empty and reassemble twenty-two 36-in., 60-plate presses in 8 hrs. Leakage and dripping often result from dirty gasketing areas or sprung wooden plates; a leaking press should be examined for such defects, the plates thoroughly cleaned, and the closing pressure on a wood press increased to assure complete contact of the plates and frames.

A drier cake will result from air-blowing the filled press to purge the filtrate or wash from the cake and

press channels. In some applications it has been suggested that steam or warm air be blown through the filter to recover vapors from the cake and partially dry it. If the temperature of the purge gas is too high, however, cloth deterioration and failure will result. Caution should be observed, however, in air-blowing a press if the filtrate is flammable.

Because the filter press is a simple device of long-standing use, processes are sometimes encountered in which the press, like the nutsche, is still being used, in spite of being less efficient and economical than another type. Filter-press installations which date back a number of years should be scrutinized; if the operation has become a steady one that requires continual use of several presses it may well be that a continuous filter can replace them.

#### HORIZONTAL PRESSURE FILTERS

The simplest form of horizontal pressure filter is the aforementioned pressure nutsche. A useful small filter of the horizontal multiple-plate type, however, is made.<sup>48, 49</sup> It consists of a number of horizontal circular drainage plates and grids placed one above another in a coaxial cylindrical shell and connected in parallel. This filter resembles somewhat a filter press stood on one end and with only one face of each plate used for drainage. Sparkler filters<sup>49</sup> range from 8" to 33" in diameter, while the Shriver unit<sup>48</sup> is offered in two sizes, 16½" and 24" in diameter. The filter medium, cloth, paper, or a precoat of diatomaceous earth, is placed on each plate, much as in a laboratory Buechner funnel. Filtration pressure may be as high as 300 psi in special cases. The entire plate assembly can be removed in one piece for cleaning and cake removal. The Sparkler filter features a bottom "scavenger plate" which permits filtration of the last portions of a batch with a minimum of slurry heel left in the filter.

The advantages of the horizontal plate filter are its compactness, cleanliness because of its enclosure in a shell with only one closure surface, and the horizontal plate position which permits a uniform cake deposit and satisfactory cake formation without achieving a cake of predetermined thickness, as in the filter press. The horizontal position of the cake allows a run to be interrupted without the cake sloughing off. Effective washing of the cake is easily accomplished, and the removable nest of plates makes sterilizing, if required, simple. Disadvantages are the relatively small size of the filters, the relatively large headroom and floor space required per unit of filtration area (contrasted with a filter press which uses both faces of each plate). The latter often is compensated by the high filtration rates with good clarity obtainable by uniform cake deposition. The labor requirements for cake discharge, cleaning and filter medium renewal are high, although not necessarily higher than for filter presses.

In view of these advantages and limitations, the horizontal plate filter enjoys its greatest use for applications in which relatively small amounts of cake or intermittent rates of flow are involved and where cleanliness or sterile conditions (as in the food industry) are essential. It has been used for lard filtration and in edible oil recovery and (with fullers' earth) sweetening; for varnish and petroleum oil filtration, with filter paper and with or without diatomaceous earth precoat. In its smaller sizes it is particularly valuable in the pilot plant or the small chemical works where demands may vary from day to day and where the cleanliness of the filters makes them more desirable than a filter press.

#### PRESSURE LEAF FILTERS

Pressure leaf filters, as the name implies, consist essentially of an assembly of leaves or filtering elements supported

in a pressure shell. The leaves are vertical and may be circular or rectangular in shape. Each leaf consists of a heavy screen or a grooved plate over which a filter medium of fine wire cloth or (more commonly for cake filtration) textile fabric may be fitted. The leaves may be stationary or may rotate.

Stationary pressure leaf filters used most widely for cake filtrations are the Sweetland<sup>41</sup> and the Kelly<sup>42</sup> filters. The Sweetland press consists of a number of circular leaves, each suspended from the top of a horizontal cylindrical shell with which it is approximately coaxial. Each leaf connects independently to an external filtrate manifold

The chief disadvantage of the Sweetland is its requirement of exceptionally intelligent and watchful operation to avoid cake consolidation or cake dropping. Since there is no way to view the cake, its thickness must be judged from previous experience and from knowledge of the feed slurry. Other disadvantages are the inability to form as dry a cake as in a filter press, the tendency for solids in thin slurries to settle in the shell and, by classifying action, to form heavy, large-particle cake at the bottom of each leaf and thin, small-particle cake at the top, the necessity of opening the shell for dry-cake discharge, and the limitation to a

there is a screw-conveyor for cake removal in the bottom of the shell. The advantages and disadvantages of the rotating-leaf pressure filter are those of the Sweetland. An additional credit is uniformity of cake because of the rotation and ability to discharge certain cakes dry without opening the shell. On the debit side are the additional disadvantages of greater expense and complexity because of the moving leaf assembly and, with the exception of the Suchar, the inability of segregating leaf performance. The Suchar filter has a separate lead for each leaf brought out through the shaft. The scrolls in the Conkey (max. body pressure = 100 psi) and Vallez filters permit discharge of dry cake without opening the filter. These units also have cake thickness indicators.

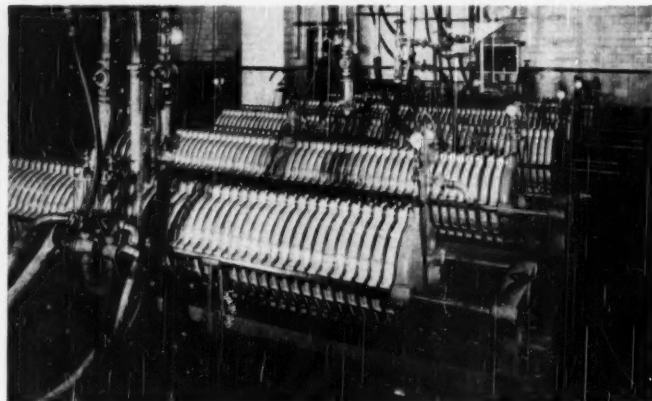
A number of other pressure leaf filters are on the market, but are intended chiefly for liquid clarification with filter-aid precoat and admixture. These are discussed, therefore, with other clarifying filters in a later section. However, they are enjoying an increasing market as cake filters.

Pressure leaf filters should be considered whenever uniformity of production permits long-term operation under essentially constant filtration conditions, when complete washing with a minimum of solvent is desired, or when vapors or fumes make closed construction desirable. Under such conditions, if the filter medium does not require frequent changing, they may have a considerable advantage in cycle and labor economy over a filter press, which has a lower initial cost, and advantage of economy and flexibility over continuous vacuum filters, which have a higher first cost.

#### CONTINUOUS PRESSURE FILTERS

The Oliver continuous pressure filter<sup>43</sup> consists of a rotating drum partially submerged in a slurry tank, wholly enclosed in a pressure shell. The action is similar to that of the familiar vacuum drum filter. But the pressure differential is from super-atmospheric down to atmospheric. Although with certain types of cake it is possible to effect a continuous discharge from the pressure system by a self-sealing screw conveyor, with most materials it is necessary to discharge the cake into a receiver which is under filtration pressure. Alternate receivers make it possible to remove solids from the system without interrupting the filter.

The Goslin-Birmingham<sup>22</sup> continuous pressure filter comprises a rotating drum enclosed in a pressure shell. The stationary valve is bolted to the head of the filter shell. Instead of pulling the valve against the wear plate, the



Enzinger Union's pulp filter uses filtermasse packs in individual trays.

through a sight glass and a shut-off cock. The shell is equipped with a sluicing pipe running its full length above the leaves, and is split horizontally at approximately its midsection into two portions. The bottom can be dropped to open the press for dry cake discharge or for leaf repair or filter cloth replacement. In operation, slurry is pumped to the shell, which it fills, and filtration occurs by passage of filtrate through the leaf and out to the manifold while cake is formed on the leaf surface. Filtration is stopped before the cakes become thick enough to consolidate. Wash water may be admitted following the slurry and the cakes may be air blown for drying. Cake removal may be by air blow-back, manual stripping, or water sluicing.

The Sweetland filter has the advantages of considerable flexibility (up to the maximum permissible, cakes of various thickness may be formed successfully), of low labor charges, particularly when the cake may be sluiced off or the dry cake discharges cleanly by blow-back, and of individual leaf control. Perhaps its greatest advantage is its adaptability to complete displacement washing.

maximum of 50 psi operating pressure.

The Kelly filter<sup>41</sup> consists of rectangular vertical leaves supported from one end of a horizontal cylindrical shell. The head supporting the leaves is removable, sliding back on a rail carriage to withdraw the leaves from the shell. Operation is similar to that of the Sweetland, except that there is no sluicing discharge and the pressure may be 300 psi or higher. The advantage of the Kelly over the Sweetland is its higher pressure range and its ability to be jacketed; its disadvantages, on the other hand, include the necessity to open the press after each cycle, the difficulty of removing the head without the cake sloughing from the leaves, and the floor space required for head retraction.

Rotating pressure leaf filters are exemplified by Vallez,<sup>22</sup> Swenson,<sup>54</sup> Suchar,<sup>55</sup> and Conkey<sup>56</sup> filters. Their circular leaves are mounted on a hollow shaft coaxial with the horizontal cylindrical shell, with filtrate discharge occurring through the shaft. The leaves are rotated at 1 to 2 rpm as filtration proceeds. Dry-cake discharge by blow-back makes it possible to operate without opening the shell, since

drum assembly is pushed against the valve head by air pressure acting in a sealed tube.

The advantages of the continuous pressure filter are those connected with continuous machines (i.e., labor saving and steady flow of materials) and with pressure filters (ability to operate at higher pressures than vacuum filters and ability to handle volatile materials unsuited to vacuum filtration). Its disadvantages center about its mechanical complexity, reflected in difficulty of operation and of solids removal, high price, smallness of size (compared to rotary vacuum filters), and limitation to relatively low pressures (30 psi maximum). The inaccessibility of its moving parts during operation is an additional disadvantage. Unless the flow of material is extremely steady and of such volume as to justify continuous operation, a batch pressure filter is usually a better choice.

A continuous gravity filter<sup>4</sup> consisting of a deeply submerged horizontal rotating drum of screen wire through which water from a slurry of wood pulp flows by hydrostatic head, leaving a layer of pulp on the drum, has been in use a number of years. Its use has been restricted exclusively to the pulp and paper industry.

#### VACUUM FILTERS

Vacuum filters are those which operate with less than atmospheric pressure on the downstream side of the filter septum. Most vacuum filters are continuous; in fact, the chief justification for vacuum filtration is its adaptability to continuous systems. The vacuum filters discussed in the following paragraphs are all continuous devices unless otherwise indicated.

#### BATCH VACUUM FILTERS

Batch vacuum filters are of two types, the vacuum nutsche (mentioned previously) and the Moore vacuum leaf filter. Vacuum nutsches should be avoided except in semiworks or small-scale operation. For the latter purpose stoneware units can be purchased from the ceramic equipment companies, and two units known as the "Loccite" and "Pot-type" filters<sup>14</sup> and claiming special filter medium retaining features are available in several metals.

The Moore filter is an assembly of vertical filter leaves descending from a vacuum manifold. In operation it is placed in a slurry tank for sufficient time to allow cake formation; a crane then lifts it from the slurry tank, places it in a wash tank (if washing is desired), and finally, after a dewatering period, transports it to a cake-deposit tank or bin, where the cake is discharged by vacuum release, blow-back,

or, if necessary, manual stripping. Moore filters<sup>15</sup> often are plant-constructed and certain firms will design them upon request.<sup>16</sup> Advantages are simplicity, low-cost, and adaptability to long cake-forming cycle and thorough washing. Disadvantages are crudeness, space requirements, and disorder and hazard identified with the possibility of sections of cake dropping from the leaves during transport from tank to

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tank. Moore filters have been used in the metallurgical industry and in the processing of certain pigments.

#### VACUUM DRUM FILTERS

By far the best known type of continuous vacuum filter is the rotary vacuum drum. Existing in a variety of forms, the vacuum drum filter consists of a horizontal cylinder equipped with evacuated sections beneath its surface, which is of screen cloth, perforated plate, or other fluid permeable material. The drum is rotated past a source of prefilter, whence it picks up a cake while drawing filtrate into its evacuated drainage lines. Wash solvent may be applied to the cake on the drum and mother liquor and wash liquor may be displaced by air drawn into the cake before it is blown, scraped, or pulled from the drum. Rotary vacuum drum filters are available in diameters ranging from 1' to 14' and in face widths ranging from 6" to 20'. Drum speeds range from 1/2 to 5 rpm, depending on the difficulty of filtration and of washing. The filter surface usually is divided into individual sections or panels, each of which is connected by a separate drainage pipe to a rotary valve. By means of the valve it is possible to vary the pressure differential across the filter surface from area to area on the drum.

The simple vacuum drum filter<sup>13, 16, 19, 20, 22, 26, 41, 54</sup> has a light fabric cover which is caulked or sealed at the division strips between the vacuum sections. Some types are wired tightly

with circumferential wires or bands. The lower part of the drum is submerged in a tank of slurry from which it withdraws filtrate and deposits a cake on its surface. The cake is discharged by a light air blow a few inches before the doctor knife is reached. For the cake to discharge readily it should be at least 1/8" thick, and preferably thicker. Other mechanical means can be used for sticky or false-bodied cakes which may gum on the knife and fail to discharge with a normal air blow. A fairly free filtering material is desirable for easy handling by the simple vacuum filter.

The simple drum filter, like all rotary vacuum types, is limited to displacement washing. The area which can be devoted to wash sprays is limited and the rate is too high to permit diffusion of solute out of the cake.

However, the thinness and uniform density of the cake permit fairly uniform displacement of the filtrate by wash solvent, and for many cases, which require only simple displacement washing, the washing action of a vacuum filter may be quite satisfactory.

Washing effectiveness can be improved if the water sprays are spread by a cloth cover which travels over a portion of the cake. Cakes which crack cannot be washed effectively. But a compression roll preceding the wash section often will close cracks which form during dewatering. The washing of a cake in which diffusion controls, to be as complete as desired, may require reslurrying and refiltering of the solids. Two- and three-stage vacuum filtration is not uncommon.

Rotary drum filters also are less effective dewatering devices than pressure filters or centrifuges. Simple filters which employ a blow-back will produce a wet cake, unless means are provided to prevent runback of the filtrate or wash liquor, which collects in the drainage sectors and may be expelled with the air. The dewatering of highly thixotropic cakes is usually unsatisfactory unless the cake is mechanically worked on the filter surface by a vibrator or other mechanical means. In extreme cases, it may be advisable to repulp the cake upon its discharge by mechanical means alone (no addition of liquid) and refilter it.

Solids which form cakes too thin or sticky to be processed on a simple vacuum drum sometimes can be filtered by use of a "FEinc" string-discharge, an Oliver or Eimco panel, or a Bird-Young<sup>26</sup> filter. As the name implies, the string-discharge filter<sup>19</sup> employs a set of circumferential cords wound about the drum beneath the cake which are pulled off tangent to the drum by a guide roller at the point desired. As they leave the drum, they remove the

cake. A panel filter<sup>15, 41</sup> has the filter medium caulked into panel sections the length of the drum and thus eliminates the binding wires. A "floating" doctor blade can be used against which the cloth actually rides because of blow-back, or the knife can be replaced by a taut wire if the cake is gummy enough to accumulate on the blade. The wire should be guarded to prevent injury to a nearby operator if it snaps.

The Bird-Young machine,<sup>6</sup> also a panel filter, employs a large volume of low-pressure blow-back air to dislodge the cake without the use of a scraper. This filter has no valve, but applies vacuum to the entire inside of the drum, which operates with deep submergence to permit removal of the filtrate through an oversize trunnion. These panel filters will successfully handle a cake  $\frac{1}{8}$ " or less in thickness. Their use, however, is not limited to thin cakes.

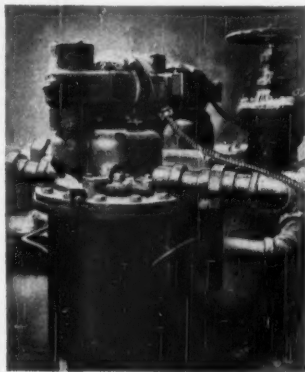
Suspensions of coarse, granular solids which would be difficult to prevent from settling in the slurry tank of a simple vacuum drum may be filtered continuously with a top-feed, a "Dorrco," or a "Syncro-drum" filter. Top-feed filters<sup>15, 20, 41, 54</sup> are fed by having the prefilter poured onto their surface at the top or near the top on the ascending side. The surface of the drum sometimes is partitioned into hoppers for retention of the solids. The cake is discharged at the bottom of the drum or near the bottom on the ascending face. The top-feed filter sometimes is operated without a valve and hence with its entire portion under vacuum; under these conditions about  $\frac{1}{8}$ " of cake is left on the drum to prevent undue quantities of air from being drawn in. The cake may be washed by sprays, and hot air may be drawn through it to dry the solids on the filter.

The "Dorrco"<sup>41</sup> filter has its filtering surface inside a rotary vacuum drum. A pool of slurry is maintained in the lower part of the drum, and a cake is picked up as the interior drum surface rotates through the pool. To prevent the deposit of slimy fines on the filter surface as it enters the pool a slight air blow-back may be used until the filtering section is well submerged. The cake is discharged at the top of the drum by a pulsation of blow-back air which causes it to fall from the filter into a chute or conveyor leading outside the drum. Very little washing of the cake can be accomplished, since only half of the drum is available for the entire filtration cycle and the wash liquor tends to drain back into the slurry and dilute it. Hot air may be used to partially dry the cake.

The "Syncro-drum"<sup>20, 44</sup> is a double drum filter the drums of which are placed parallel to one another closely face to face. Rotation of the drums is

away from one another at the top, and the slurry is fed in the pinch between the drums. The "Syncro-drum," like the two preceding filters, can exploit the advantage of the rapid sedimentation of the larger granular particles in a slurry to provide a natural precoat for the finer solids.

Precoat vacuum filtration can be accomplished with the Oliver continuous precoat filter,<sup>41</sup> a modification of the simple vacuum drum. The operation is actually intermittent, but the cycles are long, sometimes as great as a week. A precoat of diatomaceous earth is applied to the filter. The feed tank then is filled with the slurry to be filtered,



The Cuno "Auto-Klean" cartridge-type filter is a stack of metal disks separated by spacer plates at precise intervals.

and filtration occurs on the precoat surface. The doctor knife travels slowly inward during a cycle so as to shave a cut of predetermined depth (usually 0.001 to 0.005 in.) from the precoat and cake and to expose a fresh surface of filteraid. The Oliver precoat filter thus can handle sticky, slimy solids otherwise unsuited to vacuum filtration. The precoat filter is a precision-built machine and is therefore much more expensive than the simple vacuum drum.

The "Continu-Coat"<sup>20, 44</sup> is an adaptation of the double-drum vacuum filter to precoat filtration. A precoat cake is picked up by the drums from bottom slurry tanks. The filter cake then is deposited on the precoat from a feed pool in the usual position in the pinch between the drums. Both top cake and precoat are removed on the descending face of the drum to prepare the surface for new precoat; thus, the filter is truly continuous.

The major advantages of rotary drum vacuum filters are those of labor economy, high capacity, and convenience identified with continuous processing. The wear on the filter fabric is

slight, permitting light fabric to remain in service a long time. The disadvantages are high equipment cost (only relatively large units are available), inflexibility, and temperamental operation if the feed slurry changes in quality or quantity. Replacement of a filter fabric is relatively difficult. Diffusional washing is poor, and the filtrate is usually slightly turbid (except in the case of the precoat filters). Rotary drum filters are used successfully for a variety of materials, including pigments, salt crystals, wood pulp, and sewage sludge. They have recently been adapted to the filtration-dewaxing of petroleum oil.

#### VACUUM DISK® FILTERS

Rotary disk vacuum filters are similar in principle to rotary drum filters. The filtering elements are disks instead of cylinders, and filtration occurs on the two faces of the disks, which are divided into straight or tangential segments individually connected to a rotary valve. Each sector collects cake during its passage through the slurry tank at the bottom of the disk. The cake is discharged by air blow-back with the help of scrapers, if needed. The slurry trough is of such a shape that the discharged solids do not fall back into it. Typical rotary disk vacuum filters are the American,<sup>41</sup> Conkey,<sup>20</sup> Denver,<sup>18</sup> Eimco,<sup>15</sup> and Morse.<sup>30</sup>

In addition to the advantage of continuous operation, rotary disk filters provide very large filtering area and capacity per unit of floor space. Their major disadvantage is their inadaptability to effective washing (wash solvent cannot be applied uniformly to the vertical disk face without considerable dilution of the prefilter). They are about as expensive as drum filters, but drum filters are more frequently encountered in the chemical industry.

#### CONTINUOUS HORIZONTAL VACUUM FILTERS

Two continuous vacuum filters with horizontal filtering surfaces are used in the mining and metallurgical industries and to some extent in the chemical process field. They are the Lurgi band filter<sup>43</sup> and the Oliver continuous horizontal filter.<sup>41</sup>

The Lurgi filter is essentially a perforated rubber belt conveyor which supports a filter fabric and which travels across a suction box. The slurry is pumped onto the filter at one end, wash liquor is added along the path of the belt's travel (rubber dams which wipe against the cake separate the fil-

\* This word, used later in connection with clarifiers, is spelled alternatively with a k and with a c. For consistency, it will be written disk throughout this paper except in connection with trade names.

tering zone and washing zones from one another), and the cake is dumped from the other end of the filter as the belt descends over the pulley. On the lower (return) side the belt and filter cloth are separated for the laundering action of water sprays. Warm air may be used partially to dry the cake as it travels along the belt.

The Oliver horizontal filter is a rotating annular table whose top surface is a filter medium. Vacuum is applied through a drainage chamber beneath the table which leads directly into a large rotary valve. Slurry is pumped onto the table at one point and the cake is removed a few degrees counter-current to this point by a scroll conveyor which elevates it over the side of the filter. About  $\frac{1}{8}$ " of cake is left on the filter, and it is roughed up by a high velocity spray before new slurry is added. Washing and drying may be effectively accomplished between the points of feed and discharge.

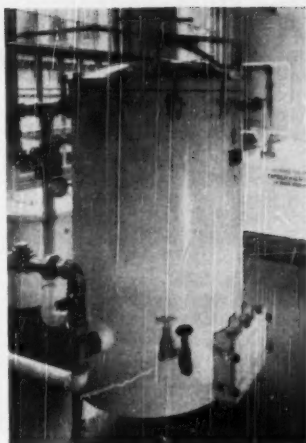
Both the Lurgi and Oliver horizontal filters have the distinct advantages of permitting thorough washing of a truly countercurrent character and of allowing the independent choice of cake thickness, washing time, and drying cycle. They are limited to use on relatively free filtering materials. When operating on slow filtering slurries, a portion of the fines remain on the cloth and subsequently reduce the filtration rate. Their chief disadvantages are the large floor space required per unit of capacity and their relatively high investment cost per unit of filter area. The latter is balanced somewhat by high capacity per unit of area. Rapidly settling solids are easily handled.

Continuous horizontal vacuum filters have enjoyed considerable success in the filtration of phosphate rock residues. It is believed that they may be used to advantage elsewhere in the chemical industry where continuous processing and thorough washing with a minimum of solvent are desirable.

## CLARIFYING FILTERS

Clarifying filters are used to separate liquid mixtures which contain only very small quantities of solids. When the solids are finely divided enough to be observed only as a haze, the filter which removes them is sometimes called a polishing filter. Compared to cake filters, clarifying filters are of minor importance to pure chemical process work, their greatest use being in the fields of beverage and water polishing, pharmaceutical filtration, fuel and lubricating oil clarification, electroplating solution conditioning, and dry cleaning solvent recovery.

Most cake filters can be operated to serve as clarifiers. On the other hand,



Screen-covered vertical rectangular leaves are utilized in the precoat pressure filter of U. S. Hoffman Machinery Co.

a number of clarifying filters have been developed which can be used for no other purpose than clarifying or straining. In general, clarifying filters are less expensive than cake filters. Clarifying filters may be classified as disk and plate presses, precoat pressure filters, cartridge clarifiers, strainers, and miscellaneous types. As mentioned previously, strainers will not be discussed.

### DISK FILTERS AND PLATE PRESSES

Filters employing asbestos-pulp disks, cakes of cotton fibers (filter-masse), or sheets of paper, pulp, or asbestos are used widely for the polishing of beverages, plating solutions, and other low-viscosity liquids containing small quantities of suspended matter. The so-called disk filter<sup>3, 17, 37</sup> comprises an assembly of pulp disks made of asbestos and wood-pulp fibers sealed into a pressure case. The disks may be pre-assembled into a self-supported unit, as in the "Disc-pak" filter,<sup>3</sup> or each disk may rest on an individual screen or plate, as in the "N.F.C."<sup>17</sup> "Positive Seal,"<sup>17</sup> and "Sealed-Disc"<sup>18</sup> filters. The disk assembly is compressed into the case when the cover is tightened,<sup>3, 37</sup> or by a separate screw inside the case.<sup>17</sup> The liquid flows through the disks and into a central discharge manifold. Flow rates are on the order of 3 gal./ (min.) (sq. ft.), and the operating pressure does not normally exceed 50 psi (usually it is less). Individual filters are built to deliver up to 6000 gph of low-viscosity liquid.

Pulp filters<sup>16, 30, 31, 40</sup> employ one or more packs of filter-masse (cotton fibers compressed to a compact cylinder) stacked into a pressure case. The packs are sometimes supported in individual trays which provide drainage channels, as in the "Schalenfilter,"<sup>16</sup> and some-

times rest on one another with a loose spacer plate between each two packs and with a drainage screen buried in the center of each pack.<sup>31</sup> The liquid being clarified flows under a pressure of 50 psi or less through the pulp packs and into a drainage manifold. Flow rates are somewhat less than for disk filters, on the order of 0.5 gal./ (min.) (sq. ft.). Pulp filters are used chiefly to polish beverages. The filter-masse may be washed in special washers<sup>31, 41</sup> and reformed into new cakes.

Plate presses,<sup>5, 10, 11, 17, 18, 28, 29, 30, 32, 40, 46, 47, 51, 56</sup> sometimes called sheet filters, are assemblies of paper or asbestos sheets, plates, and sometimes screens or frames. They are essentially modified filter presses with practically no cake-holding capacity. A press may consist of many plates<sup>16</sup> or of a single filter sheet between two plates,<sup>29</sup> the plates may be rectangular<sup>10</sup> or circular,<sup>47</sup> and the sheets may lie in a horizontal<sup>5</sup> or in a vertical<sup>51</sup> plane. The operation is similar to that of a filter press, and the flow rates are about the same as for disk filters. The operating pressure usually does not exceed 20 psi. The presses are used most frequently for low-viscosity liquids, but an ordinary filter press with thin frames is often used as a clarifier for 1000-poise rayon spinning solution. In the latter case, the filter medium is usually a sandwich pack of pulp sheets, canton flannel, and muslin and the filtration pressure may be 1000 psi.

Disk, pulp, and sheet filters accomplish extreme clarification, removing 0.01-micron particles and larger. Particles larger than 5 microns normally are removed by a roughing filter which precedes the polishing operation.

### PRECOAT PRESSURE FILTERS

Precoat pressure filters consist of one or more leaves, plates, or tubes upon which a coat of diatomaceous earth or other filteraid is deposited to form a filtering surface for clarification. Filter paper is often substituted for a precoat. Additional filteraid may be mixed with the liquid to be filtered, particularly if the solids are gelatinous or sticky, in order to maintain a higher average filtration rate. Precoat pressure clarifying filters are essentially no different from pressure cake filters, except for the purpose to which they are put. Although with the proper choice of diatomaceous earth and filtration rate they may become essentially a polishing filter, they are more often used with "faster" filteraid and at higher rates as roughing clarifiers. Thus they may precede the polishing filters in beverage processing, they are widely used as dry-cleaning-solvent recovery units, and they have been adopted for swimming-pool water clarification.

The filtering elements may be screen-covered vertical rectangular leaves in a vertical cylindrical tank,<sup>7, 9, 11, 16, 24, 28, 31, 34, 38, 56</sup> screen-covered vertical circular leaves in a horizontal cylindrical tank,<sup>7, 11, 23, 49</sup> circular porous ceramic leaves,<sup>54</sup> wire-wound cylindrical leaves,<sup>40</sup> or hollow tubes of porous stone,<sup>1, 12, 42, 46, 51, 55</sup> porous carbon,<sup>1, 12</sup> wire cloth,<sup>1, 55, 63</sup> or porous stainless steel sheet.<sup>54</sup> They may be fabric-covered or not. One arrangement<sup>16</sup> permits sampling of each individual leaf discharge and also allows the operator to remove any one leaf from service. Plate-and-frame presses also have been adapted to precoat-clarification use.<sup>40, 50</sup>

Much of the novelty in precoat pressure filters lies in the methods employed to remove the cake at the end of a cycle. Since the cake discharges cleanly from the filtering elements and normally is discarded, there is opportunity to remove it without opening the filter shell. Some models accomplish this by a simple backwash, and the Adams and "Stellar"<sup>29</sup> filters have improved backwashing by providing a sudden rush of clear filtrate under air pressure. In the "Pur-O-Cel" filter,<sup>45</sup> the cake is loosened before backwashing by the accumulation and sudden release of pressure, whereas an application and release of vacuum cleans the screens of the "Mitco" filter.<sup>35</sup> Various sluicing arrangements are employed to flush the cakes from the elements: for example, an oscillating and reciprocating water manifold across the top of the leaves is used in the Niagara "Auto-sluice" filter;<sup>38</sup> and in the Swenson-LeVal "Poly-Flo"<sup>54</sup> and the Hercules "Self-cleaning"<sup>23</sup> filters, the leaves are rotated past high-velocity sprays which scour them. The Enzinger diatomite unit<sup>16</sup> utilizes a stationary high pressure sluicing valve. "Industrial" filters<sup>28</sup> use air agitation in the liquid filled tank for rapid removal of the cake. Others use rotating brushes<sup>49</sup> or mechanical scrapers.<sup>56</sup>

Care must be taken in operating precoat filters that a complete, uniform layer of filteraid is deposited on the element before filtration starts. Proper precoat is difficult unless air pockets at the top of the filter are eliminated. If the filter element is exposed at any point, it may become locally plugged; at the plugged point, no precoat will be deposited in the future, and this irregularity may cause adjacent portions of filteraid to slough off, with consequent additional element plugging. The capacity of the filter thus can soon be seriously reduced.

#### CARTRIDGE CLARIFIERS

Cartridge clarifiers are units which consist of or use one or more replace-

able or renewable cartridges containing the active filter element. The unit usually is placed in a line carrying the liquid to be clarified; clarification thus occurs while the liquid is in transit. Mechanical or edge filters consist of stacks of metal disks separated to precise intervals by spacer plates<sup>58, 62, 77</sup> or a wire wound on a cage in grooves of a precise pitch<sup>62</sup> or a combination of the two.<sup>73</sup> Skinner<sup>74</sup> uses layers of an impregnated crepe paper ribbon. The liquid to be filtered flows radially between the disks, wires or layers of paper and particles larger than the spacing are screened out. Edge filters can remove particles down to 0.001 in (25 microns), but more often have a minimum spacing of twice this value. They have small solids-retaining capacity and hence must be cleaned often to avoid plugging. Continuous cleaning is provided in some filters. Thus the Cuno "Flo-Klean,"<sup>62</sup> a wire-wound unit, employs a slowly rotating nozzle which backwashes the element with filtered liquid; Cuno "Auto-Klean"<sup>62</sup> and Purolator<sup>73</sup> filters are equipped with scrapers. The "Auto-Klean" scraper fits into the spaces between disks to comb away the accumulated solids. In either case, the dislodged solids fall into a sump which may be drained periodically.

The greatest number of cartridge clarifiers are of the micron class, fiber,<sup>56, 59, 61, 62, 64, 66, 67, 71, 76</sup> resin-impregnated filter paper,<sup>81</sup> porous stone,<sup>2, 21, 59, 60</sup> or porous stainless steel elements<sup>44</sup> of controlled porosity. Other rustless metals are also available.<sup>44</sup> The elements may be chosen to remove particles larger than a fraction of a micron, although many are made to pass 10-micron solids and smaller. By proper choice of multiple-cylinder cartridges or multiple cartridges in parallel any desired flow rate can be obtained at a reasonable pressure drop (often less than 20 psi). When the pressure rises to the permissible maximum, the cartridge must be opened and the element replaced. Micronic elements of the fiber type cannot be cleaned and are so priced that they can be discarded or the filter medium replaced economically. Stone elements usually must be cleaned, a process best accomplished by the manufacturer of the porous ceramic or in accordance with his directions. The user can clean stainless steel elements by chemical treatment.

Some cartridges are packed with adsorbent carbon or fullers' earth for oil purification<sup>56, 67, 68</sup> and some are combinations of paper or cloth and wire screen.<sup>32, 39, 63, 70, 77</sup> Fullers' earth or other adsorbent filter media should be used with caution if lubricating or cutting oil is being filtered. The adsorbent

action of the media may remove valuable additives from the oil.

#### MISCELLANEOUS CLARIFIERS

Certain oil clarifiers pump or percolate the oil through chambers packed with waste, non-metallic fiber, adsorbent solids,<sup>8, 45</sup> or through a cloth bag.<sup>29</sup> The slow rate of gravity percolation<sup>8</sup> makes it generally unsuitable for chemical process work.

The Hopkins filter<sup>23</sup> for clarifying dry-cleaning solvent consists of a battery of horizontal cloth bags arranged on a tier of drainage plates. The bags are precoat internally with diatomaceous earth and the solvent is pumped through them to the drainage plates.

For the selective removal of iron or other magnetic particles from a liquid (e.g., from a clay slip), several magnetic separators are available. Some of these are listed in Table III. The Frantz "Ferrofilter"<sup>81</sup> consists of a stack of soft steel grids strongly magnetized by a direct-current coil or by a permanent magnet. The liquid to be filtered is flowed over the grids, which collect any magnetic solids present. Particles as small as one micron are said to be removed. The grids are cleaned by demagnetization and flushing. The Stearns magnetic screen filter<sup>82</sup> and the Eriez ferrous filter,<sup>80</sup> which uses a permanent magnet, employ the same general principle. The Barnes drill magnetic coolant separator<sup>79</sup> flows the liquid around a magnetized rotating drum to which magnetic particles adhere. These are removed by a scraper blade.

#### SPECIAL FILTERS

Filtration equipment is widely used by the pulp and paper industry, water purification plants, and sewage disposal systems. Because of its specialized application, such equipment has been omitted from this paper.

#### THICKENERS

Thickeners are devices which remove a portion of the liquid from a slurry to increase the concentration of solids in suspension. Thickening is done to prepare a dilute slurry for more economical filtration, or to change the consistency or concentration of the slurry for process reasons.

Generally the most economical method of thickening is to use gravity sedimentation tanks, such as the Dorr thickener. Occasions arise, however, where the space required by a gravity thickener is not available or where the thickener must be housed; under these circumstances, two filter type mechanical thickeners may be useful.

The Oliver-Borden thickener<sup>41</sup> consists of a trough-bottom tank in which

TABLE I. MANUFACTURERS OF CAKE AND CLARIFYING FILTERS

Code Number	Name	Address	City	Identifying or Trade Names
1	R.P. Adams Co.	225 East Park Drive	Buffalo 17, N. Y.	"Poro-Stone," "Poro-Carbon," "Poro-Screen"
2	Allen Industrial Filter Co.	25 S. St. Clair Street	Toledo 4, Ohio	Mander
3	Alsop Engineering Corp.	Midvale, Conn.	Midvale, Conn.	"Sealed-Diac," "Disc-Pak"
4	American Paper Machinery and Engineering Works	P. O. Box 1	Glen Falls, N. Y.	"Apnew"
5	Belke Manufacturing Co.	947 N. Cicero Ave.	Chicago 51, Ill.	
6	Bird Machine Co.		S. Walpole, Mass.	
7	Blackburn-Smith Mfg. Co.	Seaboard Trust Bldg.	Hoboken, N. J.	"Refiner"
8	Burt Mfg. Co.		Akron 11, Ohio	Burt, Cross
9	Butler Mfg. Co.	13th and Eastern Ave.	Kansas City 3, Mo.	
10	Cellulo Co.	2100 Forst St.	Sandusky, Ohio	
11	Columbia Filters, Inc.	199 Seventh Ave.	Hawthorne, N. J.	"Colab," "Coleaf"
12	Cooperative Industries, Inc.	100 Oakdale Road	Chester, N. J.	"Fleetklean"
13	Denver Equipment Co.	P. O. Box 5268	Denver 17, Colo.	"Locitie," "Pot-type"
14	Desert Sun Dry Fruit Co.	225 Clay Street	San Francisco 11, Calif.	
15	Elmcro Corporation	634 S. 4th West St.	Salt Lake City 8, Utah	"E.U.C.," "Schulenfilter"
16	Enslinger Union Corp.		Kingston, N. Y.	
17	Ertel Engineering Corp.	2424 S. Michigan Ave.	Chicago 16, Ill.	"Filco," "Filpaco"
18	Filter Paper Co.	155 Oraton St.	Newark 4, N. J.	"Feine"
19	Filtration Engineers, Inc.	10 East 49th Street	New York 17, N. Y.	Conkey
20	General American Transportation Corp.	332 West 21st Street	New York 11, N. Y.	"Berkfeld," "Rex"
21	August Giese and Son		Birmingham 1, Ala.	Vallez
22	Goslin-Birmingham Mfg. Co.	204 21st Avenue	Patterson 3, N. J.	
23	Hercules Filter Corp.		Mishawaka, Indiana	
24	Hills and Morrow		Hatfield, Pa.	
25	Hopkins Equipment Co.	17 Stone Street	Newark 4, N. J.	"Horm," "Sanitype"
26	F. H. Hormann and Co.	240 48th Street	Brooklyn, N. Y.	
27	Independent Filter Press Co.	1621 W. Carroll Avenue	Chicago 12, Ill.	
28	Industrial Filter and Pump Mfg. Co.	325 W. 25 Place	Chicago 16, Ill.	Inflico, International, "Stellar"
29	Inflico, Inc.		Cincinnati 2, Ohio	"Kakimaco," "Monocell," "Monopad," "Diacell"
30	Karl Kiefer Machine Co.			
31	Klein Filter and Mfg. Co.	1225 School St.	Chicago 13, Ill.	
32	Frank B. Lomas Co.	3514 N. Halsted St.	Chicago 13, Ill.	
33	Merco Engineering Works	30 Church St.	New York 7, N. Y.	Lurgi
34	Micro Metallic Corp.	193 Bradford Street	Brooklyn 7, N. Y.	"Gravitain," "Surfamass"
35	J. B. Mitchell Co.	4916 W. Jefferson Blvd.	Los Angeles 16, Calif.	"Mitco"
36	Morse Bros. Machinery Co.	Broadway & Viaduct	Denver, Colo.	
37	National Filter Corp.	147 West 22nd Street	New York 11, N. Y.	"N.F.C."
38	Niagara Filter Corp.	3080 Main Street	Buffalo 14, N. Y.	"Auto-slucic"
39	Wm. W. Nugent and Co.	410 N. Hermitage Ave.	Chicago 22, Ill.	
40	Ogden Filter Co.	4214 Santa Monica Blvd.	Los Angeles 27, Calif.	
41	Oliver United Filters, Inc.	33 West 42nd Street	New York 18, N. Y.	"Dorrico," Kelley, Oliver, Sweetland, American
42	Olson Filtration Engineers	1624 N. Kilbourne Ave.	Chicago 39, Ill.	
43	Patterson Foundry and Machine Company		East Liverpool, Ohio	
44	Peterson Filters and Engineering Company	137 Motor Avenue	Salt Lake City 1, Utah	"Continu-Coast," "Synco-Drum"
45	%Proportioners%	P. O. Box 1442	Providence 1, R. I.	"Pur-O-Cel"
46	Republie Seita Filter Corp.	17 Stone Street	Newark 4, N. J.	Seita
47	Scientific Filter Co.	1 Franklin Square	New York, N. Y.	
48	T. Shriver and Co.	808 Hamilton St.	Harrison, N. J.	
49	Sparkler Mfg. Co.		Mundelein, Illinois	
50	R. Sperry and Co.		Batavia, Illinois	
51	Star Liquid Machinery Co.	871 Edgewater Road	Hunts Point, Bronx 59, N. Y.	
52	Stearns-Roger Mfg. Co.		Denver 2, Colo.	Moore
53	Suchar Engineering & Sales Co.	82 Beaver Street	New York 5, N. Y.	"Auto Filter"
54	Svenson Evaporator Co.		Harvey, Illinois	LeVal, "Poly-Flo"
55	Titeltes, Inc.	500 Frelinghuysen Ave.	Newark 5, N. J.	
56	United States Hoffman Machinery Co.	219 Lamson Street	Syracuse 6, N. Y.	
57	Valley Foundry & Machine Works	710 H St.	Fresno 17, Calif.	

TABLE II. MANUFACTURERS OF CLARIFYING CARTRIDGE FILTERS

Code Number	Name	Address	City	Identifying or Trade Names
58	Adel Precision Products Corp.	10777 Van Owen St.	Burbank, Calif.	
59	Briggs Filtration Co.		Bethesda 14, Md.	
60	Commercial Filters Corp.	18 W. 3rd St.	Boston 27, Mass.	"Fulflo," "Honeycomb"
61	Consolidated Siphon Supply Co.	22 Wooster St.	New York 13, N. Y.	"Rapid-Flo," Terras
62	Cuno Engineering Corp.		Meriden, Conn.	"Auto-Klean," "Flo-Klean," "Micro-Klean," "Staynew"
63	Dollinger Corp.	11 Centre Park	Rochester 3, N. Y.	"Engine-Life"
64	Engle Life Products Corp.	115 S. Granada Ave.	El Monte, Calif.	
65	Fostoria Pressed Steel Corp.		Fostoria, Ohio	
66	General Filters, Inc.	12890 Westwood Ave.	Detroit 23, Ill.	
67	Hillard Corp.	102 W. 4th St.	Elmira, N. Y.	"Hilco"
68	Honan-Crane Corp.		Lebanon, Ind.	
69	Klemm Automotive Products Co.	1718 N. Damen Ave.	Chicago 47, Ill.	
70	Marvel Engineering Co.	625 W. Jackson Blvd.	Chicago 6, Ill.	"Synclinal"
71	Morrow Filter Co.	5 W. Chesapeake Ave.	Towson 6, Md.	"Oertex"
72	Petroleum Accessories, Inc.	6531 Russell St.	Detroit 11, Mich.	"Micropak"
73	Purolator Products, Inc.		Newark 2, N. J.	
74	Steiner Purifiers Div., Bendix Aviation Corp.	1500 Trombley Ave.	Detroit 11, Mich.	
75	Wagner Filter Co.	P. O. Box 3096	Tulsa 8, Okla.	"Excel-as"
76	W. G. B. Oil Clarifiers, Inc.		Kingston, N. Y.	"W.G.B."
77	Winflow Engineering Co.	4069 Hollis St.	Oakland 8, Calif.	
78	Zenith Carburetor Division	696 Hart Ave.	Detroit 14, Mich.	

TABLE III. MANUFACTURERS OF MAGNETIC CLARIFIERS

Code Number	Name	Address	City	Identifying or Trade Names
79	Barnes Drill Co.	814 Chestnut St.	Rockford, Ill.	"Barnedril"
80	Erie Mfg. Co.	629 Commerce Bldg.	Erie, Pa.	
81	S. G. Frantz Co.	161 Grand St.	New York 13, N. Y.	"Ferrofilter"
82	Stearns Magnetic Mfg. Co.		Milwaukee 4, Wis.	

are suspended a number of hollow, perforated, vertical tapered tubes covered with fabric. Slurry to be thickened is admitted to the tank continuously. The tubes are connected to a vacuum pump and to a compressed air line by means of a rotary valve which alternately applies vacuum and momentary pressure to each tube. Thus a cake is built up on the tube, and is blown off into the surrounding slurry through which it sinks to the tank bottom. A scraper and diaphragm pump continuously remove the thickened sludge from the tank bottom.

The Shriver continuous thickener<sup>18</sup> is a modification of a filter press in which the frames are replaced by plates of special design. The special plates carry spiral or vertical channels formed by baffle strips, the latter so arranged as to feed a liquid from left to right across the plate by successive vertical traverses. Slurry to be thickened is fed to the thickener press and into one of the special plates. As it flows across the plate, part of the suspending liquid is filtered through the cloth on the frame in the usual manner; the thickened slurry emerges from the plate on the opposite side. A number of the thickener plates may be operated in series or in parallel in the same press.

Since the filter fabric of a thickener is exposed frequently to the slurry there is more likelihood that the cloth will bleed solids to a greater extent than usual and, more importantly, that it will blind more quickly than normal; this would necessitate frequent cloth replacement.

## FILTER SELECTION

The engineer faced with the problem of selecting a filter for a given application may be bewildered by the variety of equipment designs available. Actually, however, the choice is less difficult than it may at first appear.

First the general type of operation must be selected, whether pressure or vacuum, whether continuous or batch, whether cake filtration or clarification. Clarifying filters will be excluded unless the solids concentration is very low (usually less than 0.1%) and the operation will be one of cake filtration. If a clarifying filter is indicated, the type of clarifier will be dictated by the concentration of solids and by minimum size of particle which must be removed. In general, it may be said that if the minimum particle to be removed is

>100 mesh,	use simple strainers
25-300 microns	edge filters
	micronic filters
5-25 microns	precoat filters
	pulp, disk, or
0.01-5 microns	sheet filters

Pulp, disk, and micronic filters are satisfactory only if the solids content

of the prefilter is exceedingly small; otherwise plate presses or precoat filters should be selected.

If cake filtration is indicated, the choice between batch and continuous filtration will be dictated first by the nature of the process. Unless a strictly continuous process whose product is unvarying from day to day is anticipated, continuous equipment usually cannot be justified. Furthermore, since continuous equipment means generally vacuum filters, the material must be relatively free-filtering and easy to wash and dewater. A vacuum leaf test may be made; unless about  $\frac{1}{4}$ " or more of cake will form on a leaf in 4-5 min. under 20" or less of vacuum, the material probably will require a pressure filter; less than  $\frac{1}{4}$ " of cake under these conditions definitely indicates a pressure filter.

The exact choice of filter within these groups and selection of the proper size is less simple. The choice usually can be made only after small-scale pressure or vacuum leaf tests have been made. Although test equipment can be purchased or borrowed, the technique and experience required to conduct satisfactory filtration tests and to interpret the data correctly make it advisable for one untrained in filtration work to consult the manufacturer of filter aids or of the equipment being considered. These manufacturers will be in position to undertake the necessary experimental work and to render a technically sound decision based on the data obtained.

## FILTER BASES AND AIDS

This paper has been concerned only with primary filtration equipment, with no consideration of auxiliary equipment (e.g., pumps), filter bases, and filter aids.

Although an exposition of the various filter media available cannot be undertaken here, the importance of choosing the correct medium should be mentioned in passing. The medium selected for a given application should be chemically resistant enough and physically strong enough to stand up under process conditions, as a first prerequisite. Second, it should give the filtration performance desired: it should pass a reasonably clear filtrate without plugging; the cake formed should discharge from the medium cleanly and easily. Finally, it should be reasonably inexpensive.

In addition to cotton, wool, linen, glass, and "Vinyon" fabrics which have been on the market in a number of constructions for years, there are several more recent fabrics available: nylon for resistance to abrasion, to alkali and mild acid and for smooth cake discharge; Dynel to extend the softening

temperature of "Vinyon"; and "Orlon" with still higher softening temperature and remarkable chemical inertness. Available also are such materials as impregnated cotton fabrics, porous stainless steel and metal cloth.

Diatomaceous earth remains the most useful filter aid, although mixtures of kieselguhr with other materials (e.g., Industrial "Filterbestos"<sup>28</sup>) are said to be superior for certain applications. The two major suppliers of diatomaceous earth filteraids in this country are the Dicalite Division of Great Lakes Carbon Corporation, and Johns-Manville. Highly purified wood cellulose may be employed to avoid silica contamination or provide a combustible filteraid, i. e., "Polycel" (Industrial Chemical Sales Div. of West Virginia Pulp and Paper Co.) and "Solka-Floc" (Brown Co.).

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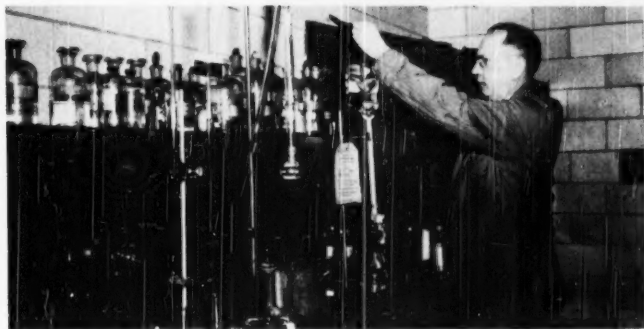
# THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES



HOWARD R. RODERICK, named general sales manager, Michigan Alkali Division, Wyandotte Chemicals Corp.

## PEOPLE



N. HOWELL FURMAN, who is Russell Wellman Moo professor of chemistry at Princeton University, has been chosen president elect of the American Chemical Society for 1951.



JOHN T. COX, JR., now with Russell S. and Gordon W. McBride, chemical engineering consultants. He was deputy director, Office of Rubber Reserve, Reconstruction Finance Corp.



JOSEPH A. COSTELLO, assistant general manager, is named vice president, Ethyl Corp.



GEORGE GRANGER BROWN, appointed director of engineering, Atomic Energy Commission.



MORRIS R. STANLEY, recently appointed director of sales for Victor Chemical Works.

## For the Farmer

**Expanded facilities aid Great Western's agriculture research.**

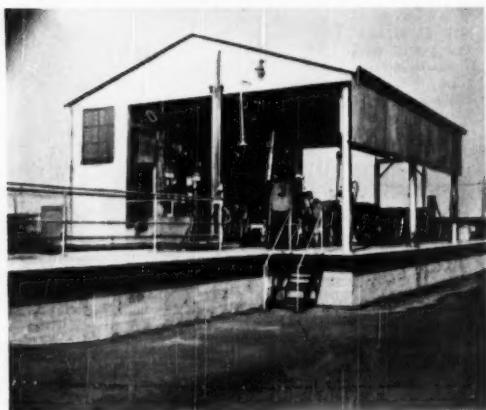
Great Western Agricultural Chemicals Research Division, Dow Chemical Co., has been expanded by the addition of new quarters at the Seal Beach, Cal., plant.

The new facilities include an office and laboratory building, a head house with 12 unit greenhouses, a warehouse and compounding room, and a flammable storage building and dock.

Basic studies necessary for the preparation of compositions suitable for use in greenhouse, laboratory and field experiments are carried out.



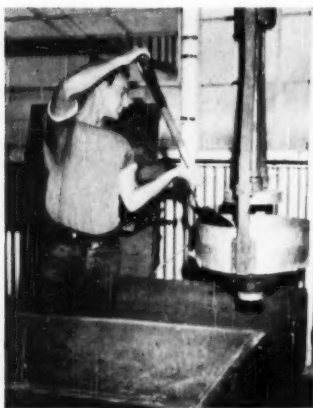
Twelve unit greenhouses, head house, soil bins, administration and laboratory buildings.



Complete facilities are available for safe handling of solvents and other flammable materials for preparing solvent compositions.



Field research men check the experimental injection rig. The jeep has been fitted with a hydraulic system to handle farming operations.



A gyrotory foundry riddle has been found to be very handy for sifting and preparing soils.

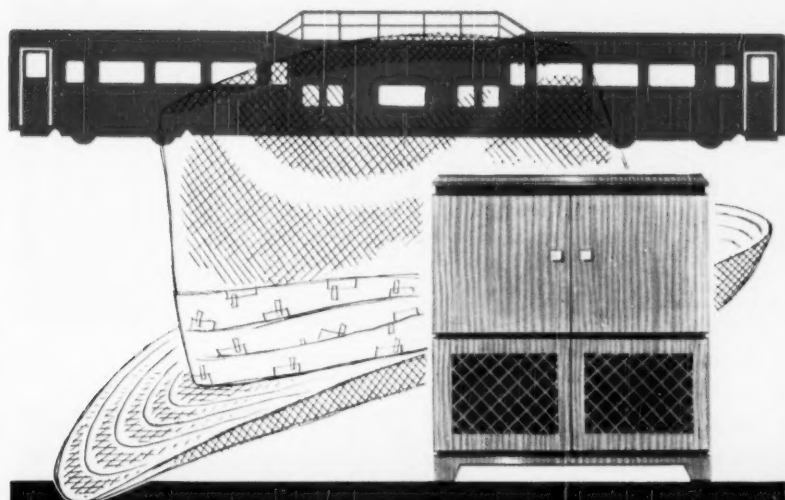


Paper cups, which are discarded after experiments, facilitate testing of soil chemicals.



Section of the compounding room; ribbon mill with duster and comminuting machine.

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Phosphoric Anhydride  
Phosphorus  
Phosphorus Oxichloride  
Phosphorus Trichloride  
Potassium Phosphates  
Hemisodium Phosphate  
Monosodium Phosphate  
Disodium Phosphates  
Trisodium Phosphate  
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Cookies—Crackers  
Cosmetics  
Denture Cleaners  
Detergents  
Dyeing  
Flameproofing  
Food Enrichment  
Insecticides  
Laundering  
Leather Tanning  
Metals and Alloys  
Metal Cleaning  
Metal Plating  
Nutrient Solutions  
Oil Drilling Muds  
Organic Chemical Mfr.  
Paint—Varnish  
Petroleum Refining  
Pharmaceuticals  
Phosphated Flour  
Plastics  
Prepared Flour Mixes  
Process Cheese  
Pulp and Paper  
Pyrotechnics—Munitions  
Rustproofing  
Salt  
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Sugar  
Textile Processing  
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Water Proofing  
Water Treatment

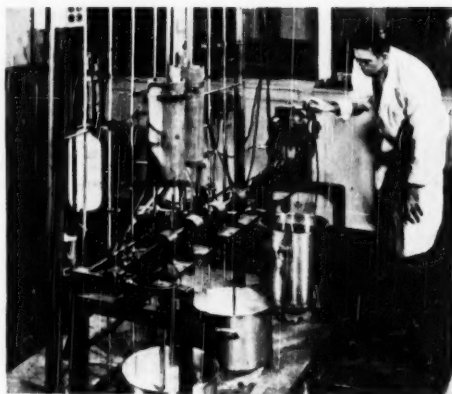


A corner of the new Harshaw laboratory for research in metallic soaps.

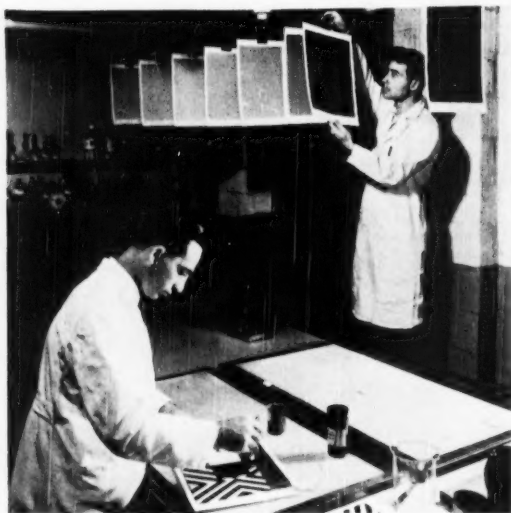
## Soap, Pigments Lab

Pigment and metal soaps research facilities duplicate plant conditions in the laboratory.

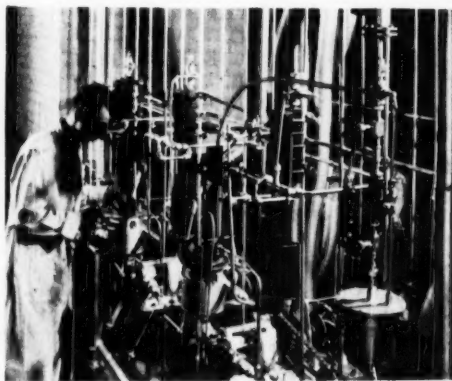
The Harshaw Chemical Co. has just completed its research laboratory for the investigation of pigments and metallic soaps. The laboratory apparatus for the preparation of metal soaps are scaled-down models of the actual equipment used in plant operations and of the same metals. These are operated in just the same way as the plant equipment.



Laboratory preparation of metallic soaps by precipitation.



Testing the hiding power of paint in a dry color laboratory.



Miniature production of metallic soaps by fusion process.

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FORMULA:  $\text{Na}_5\text{P}_3\text{O}_{10}$   
STRENGTH:  $\text{P}_2\text{O}_5$  57% pH of 1% solution 9.7  
SOLUBILITY: 75° F 45 parts in 100 parts water

**B**LOCKSON TRIPOLYPHOSPHATE offers the chemical industry an effective combination of water softening, dispersing and sequestering properties plus a high compatibility with varied mixtures. The ability of its aqueous solutions to disperse viscous or gummy materials, and in general, to deflocculate, suspend and otherwise modify water insoluble substances... suggests experimental application to your own particular problem. Bulletin and sample on request

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Blockson STPP saves soap by softening hard water so that the soap can not react with the calcium and magnesium.

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Its dispersing properties help in forming a stable suspension of the dirt in laundering operations... thus preventing its redeposition on the washed articles, even during the rinsing operation.

### SEQUESTRATION

The sequestered calcium and magnesium is held in a soluble combination—not affected by addition of substances that normally precipitate these hardness elements.

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Blockson STPP is stable through a wide range of temperatures—even in hot alkaline solutions under normal

conditions of use. It retains its sequestration properties indefinitely at room temperatures.

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Blockson STPP free flowing under normal conditions of use. It can be conveniently stored or handled and accurately measured in its dry state.

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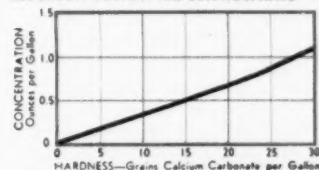
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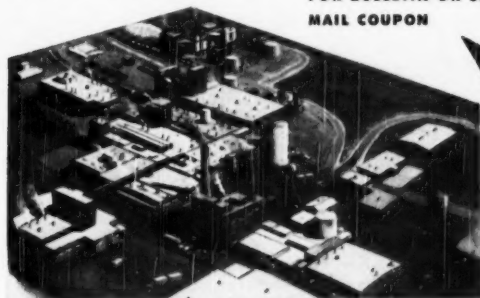
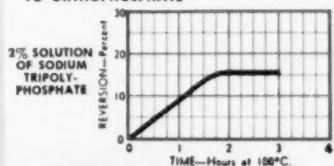
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- Trisodium Phosphate, Monohydrate
- Disodium Phosphate, Anhydrous
- Disodium Phosphate, Crystalline
- Monosodium Phosphate, Anhydrous
- Monosodium Phosphate, Monohydrate
- Sodium Acid Pyrophosphate
- Light Alumina Hydrate
- Gloss White
- Sulfuric Acid

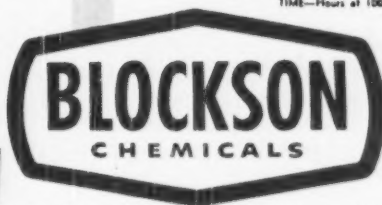
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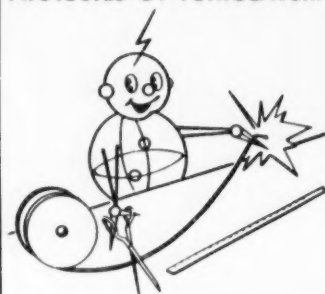
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# ANNOUNCING NEW RIBBON FORM OF LITHIUM METAL PROTECTED BY PETROLATUM



A new, convenient ribbon-form of Lithium metal is now offered for the first time by Metalloy engineers. This ribbon is  $\frac{1}{4}$  inch wide by  $\frac{1}{32}$  inch thick and wound on convenient spools. Instead of protecting it by oil immersion, it is coated with petrolatum.

Every chemist in the synthetic organic field will immediately recognize the advantages of this new form. It eliminates the necessity of weighing — the amount required is measured without removing the petrolatum and cut off. Then the petrolatum coating is easily removed by common hydrocarbon solvents. The Lithium metal remains shiny and clean right up to the time it is used.

Metalloy engineers developed this new ribbon-form at the request of volume users in the synthetic organic field. Formerly, these same engineers pioneered the manufacture of Lithium metal in the form of wire, shot, rod and cup.

If you are in doubt about the form most suitable for your operations, write today to department A for free data sheets.



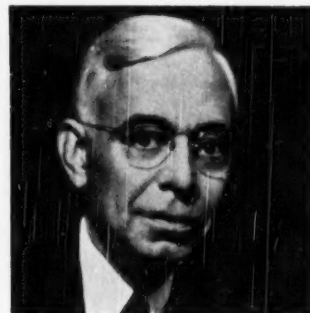
## AICHe Meets



Mott Souders, Jr., (l.) head of the chemical engineering research section, Shell Development Co., receiving the Celanese Corp. of America Professional Progress Award in Chemical Engineering from John D. Fennebresque, manager of Celanese's chemical division.



Warren L. McCabe, vice president, The Flintkote Co., elected president of AICHe for 1950.



William H. McAdams, chemical engineering professor, MIT, won the Walker Award.



T. H. Chilton, technical director, Development Engineering, Du Pont, named vice pres.



Edward G. Scheibel, Hoffmann-LaRoche, Inc., recipient of the Junior Award of the AICHe.

The American Institute of Chemical Engineers held its 42nd annual convention at the Hotel William Penn, Pittsburgh, December 4-7. Over 1600 engineers attended.

Logan B. Emlet, director of the Operations Division of the Oak Ridge National Laboratory, spoke on the peace time uses of atomic energy and pre-

dicted that radioisotopes would be used to reduce manufacturing and transportation costs of petroleum products. Richard D. Hoak of Mellon Institute headed a special session on water pollution and treatment of industrial wastes.

Officers for 1950 were elected and awards were presented (see above).

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**Uses:** In the liming of rosins in varnish manufacture; as a catalyst in preparation of metal resins (manganese, lead, zinc, etc.); in synthesis of metallic soaps for many industrial uses; in the manufacture of pharmaceuticals, synthetic resins, etc.

**Packaging:** 175 lb. fibre drums

*Reagent, Powder also available*

## AMMONIUM ACETATE

CRYSTAL, PURIFIED

In addition to being distinguished for uniform white crystals and high assay (in excess of 96%  $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ ), this B&A acetate is particularly low in iron and heavy metals, making it an ideal selection for many purity process needs.

*Reagent, Crystal also available*

**Uses:** In medicine and pharmaceuticals; in manufacture of airfoam rubber; assistant in dyeing; mordant in printing fabrics; in manufacture of heat transfer salts, etc.

**Packaging:** 250 lb. fibre drums

## POTASSIUM ACETATE

CRYSTAL, TECHNICAL & U.S.P.  
60% SOLUTION, TECHNICAL

This B&A quality chemical is produced in three grades to provide a selection suitable for the varying requirements of industry. All grades are notable for consistent high purity and uniformity.

*Reagent, Crystal also available*

**Uses:** In the manufacture of pharmaceuticals and fine organic chemicals; as a humectant in production of paper, textiles, leather, rayon, cellophane, glue, etc.; to control humidity in tobacco, etc.

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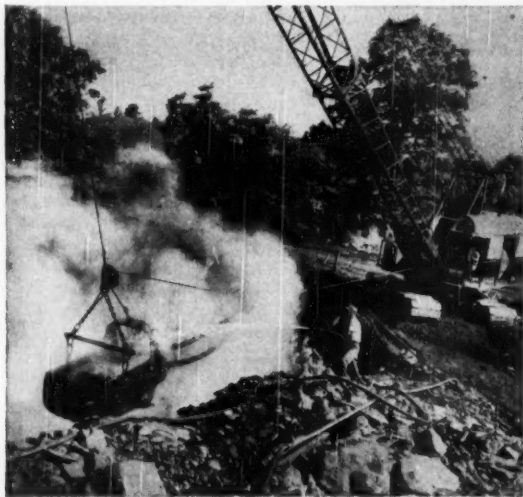
\*Complete stocks are carried here.

# Life ...on the

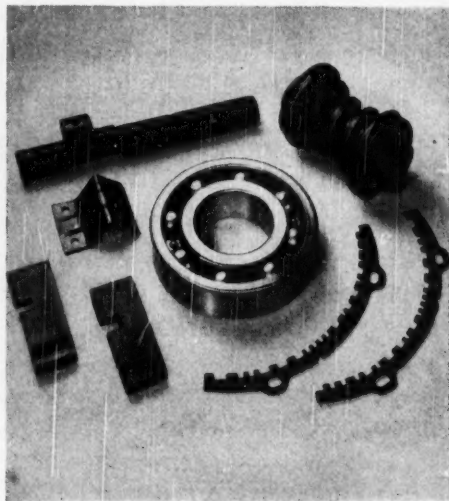


**THREE BILLION GREETING CARDS** annually find their way into Uncle Sam's mailbag, making the consumption of paper for this purpose quite an item. One of the ingredients important to paper-makers who wish to impart high brightness value to their sized papers is ACCOBRITE® Rosin Size, newest and brightest of the

rosin sizes. Available in liquid form, the ACCOBRITE sizes join an extensive line of high quality Cyanamid paper chemicals. These include wax sizes, wet-strength resins, caseins, sulfonated oils, defoamers, wetting agents, alum, soda ash, caustic soda, salt cake, acids and clays. (P.S. Don't forget February 14th.) ©Trademark



**EXTINGUISHING AN UNDERGROUND FIRE** near Pottsville, Pa., was recently accomplished with the aid of Cyanamid explosives. When a vein of hard coal became ignited, the fire progressed underground, threatening a nearby coal mine and endangering the city of Pottsville. Cyanamid's explosives engineers directed operations in which an area of approximately 6,500 square feet of overburden was removed from above the underlying seam and the burning coal was scooped out and soaked with water. This is a dramatic illustration of one of the ways modern explosives can be made to serve our industrial needs.



**HEAT TREATING OF MEDIUM AND HIGH CARBON** steel parts such as those shown above usually calls for a salt bath that will resist decarburization even under the severest operating conditions. Cyanamid's new AEROHEAT® 1190, an improved neutral type salt bath, is ideal for hardening carbon and alloy steels, reheating carburized work, annealing, brazing and for other operations. AEROHEAT 1190 is the newest in Cyanamid's complete line of quality salt baths developed to meet every need.

# Chemical Newsfront



**NEW USE FOR NEOPRENE RUBBER:** the soles of work-shoes where sure grip and good wearing qualities are essential. An important ingredient in compounding this sturdy chemical- and heat-resistant rubber is magnesium oxide, K & M Brand Magnesium Oxide, supplied by American Cyanamid Company, well known for its high quality and consistent uniformity. Further information on this product for use in neoprene formulations will be supplied on request.

## New Literature Available from Cyanamid

New additions to the technical literature available from Cyanamid are listed below. Check over this list. You may find one or more will be of special interest. Then write for copies of those you want. They are available without charge:



**1**  
**COLLECTIVE VOLUME I of New Product Bulletins** giving technical information and data on a group of new synthetic organic compounds which offer interesting possibilities for organic synthesis.



**2**  
**THE CHEMISTRY OF GUANIDINE**, a handy reference covering properties, many typical reactions and suggested uses for this important nitrogen derivative. A copy belongs in every library on nitrogen chemistry.



**3**  
**PRODUCTS AND SERVICES OF AMERICAN CYANAMID COMPANY**—Second Edition. A new composite listing of the various products supplied by the divisions of Cyanamid to meet the needs of Industry and Agriculture. A worthwhile guide to those seeking sources of supply or service information.



**4**  
**"PLASTICS NEWSFRONT"**, a bi-monthly publication issued by Cyanamid's Plastics and Resins Division, reporting news and information of general interest in the field of molded and laminated plastics.



1



2



3



4

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# CHEMICAL SPECIALTIES



Spraying dairy cattle in Cornell U. barn to control pests, insure good production.

## Livestock Pests Bow to Chemicals

by H. H. SCHWARDT, New York State College of Agriculture  
Cornell University, Ithaca, N. Y.

**SYNTHETIC INSECTICIDES** are proving their worth in controlling livestock pests, but toxicity calls for care in marketing and use.

**N**OT many years ago livestock men considered the lice, biting flies, and ticks on their animals an unavoidable evil. The great cattle tick eradication campaign during the early part of this century saved the southern cattle industry and proved beyond doubt that parasite control was possible and worthwhile. But the nicotine and arsenical dips then used had a small margin of safety and animals frequently were killed. Many refused to dip their herds or flocks unless forced to do so. When rotenone was introduced, most of the dangers attending dipping were removed and interest in control procedures increased.

The real impetus came, however, with the advent of DDT and the other chlorinated hydrocarbon insecticides that followed in rapid order. Dipping, dusting, or spraying for external parasites is now a routine item in the management of most livestock enterprises. With DDT, benzene hexachloride and rotenone, many of the serious pests of

cattle, sheep, and swine can be reduced to insignificant levels. Toxaphene, methoxychlor and chlordane can replace DDT or benzene hexachloride for many uses. Rotenone is still the only insecticide recommendable for cattle grub control.

DDT, benzene hexachloride, toxaphene, chlordane, and methoxychlor all are chlorinated hydrocarbon materials. All are residual type insecticides that remain effective for days or weeks following application. None of these chemicals has much insecticidal power in the pure state. For use they must be formulated into dusts, wettable powders, solutions, emulsifiable concentrates, or aerosols. The dusts, wettable powders, and emulsifiables are the formulations most useful in livestock parasite control.

The chemistry and methods of synthesis for DDT, methoxychlor, benzene hexachloride, toxaphene, and chlordane were discussed in a recent article by Wellman (*Chemical Indus-*

*tries*, June 1948). Since this article was published, methods of further purifying the gamma isomer of benzene hexachloride (the only insecticidal isomer) have been developed and a product of 99 per cent purity is marketed under the generic name lindane.

### LINDANE VERY PROMISING

Among the new insecticides, lindane appears likely to attain the widest usefulness in recommendations for livestock parasite control. It will kill most of the insects that attack livestock or infest animal quarters. It has the distinct advantage that it can be used on dairy cattle at dosages sufficient to kill mange mites and lice but produce only negligible milk residue. For the same reason its use in dairy barns for fly control has been approved. Lindane does not accumulate in animal tissues as does DDT. The small amounts absorbed or ingested are quickly eliminated. Lindane will kill houseflies that have become resistant to DDT and for this purpose is superior to methoxychlor, the only other residual material recommended for dairy barn use.

Consumption of lindane should increase markedly as farmers and others learn that it will control DDT-resistant flies. Since it was not generally recommended for dairy barn use until mid-July, probably only a relatively few farmers learned of its usefulness in 1949. Lindane's high cost, \$3.65 a pound retail for 25 per cent wettable powder, may limit its rapid acceptance but the single company now making it in quantity believes that significant production economies will accompany larger volume production.

Volume large enough to effect such economy, however, apparently is not in immediate prospect. It is said that the present capacity is around half a million pounds annually but this amount is not being produced. One company now surveying the field can make lindane as a by-product for a fraction of its present cost provided a two million pound volume is assured. This level of demand may be reached if lindane fully replaces DDT in fly control operations but the dreaded bogey of lindane-resistant flies is already in the literature. March and Metcalf of the California Experiment Station have demonstrated that lindane-resistant strains of houseflies already occur in California.

While housefly control in dairy

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### description

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### use

Vitamin B<sub>12</sub> appears to be the antipernicious anemia factor present in liver, vitally concerned with the formation, maturation and regeneration of red blood cells. Designed for use in the manufacture of sterile solutions of Vitamin B<sub>12</sub> for parenteral injection.

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Designated label potency at least 30,000 micrograms of Vitamin B<sub>12</sub> per gram according to L.L. assay method. In vials of 1 gram, 500 milligrams, 100 milligrams, 10 milligrams of B<sub>12</sub> activity.

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Continued clinical investigation suggests the requirement of Vitamin B<sub>12</sub> as a nutritional factor in certain forms of anemia. The oral grade solids is designed particularly as a source of Vitamin B<sub>12</sub> for the manufacture of oral products. Easily incorporated into tablets and capsules by standard procedures.

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For prices and further information on the preparation of parenteral or oral products with VITAMIN B<sub>12</sub> CONCENTRATE-PFIZER, please write: Chas. Pfizer & Co., Inc., 630 Flushing Avenue, Brooklyn 6, N. Y.; 425 North Michigan Avenue, Chicago 11, Ill.; 605 Third Street, San Francisco 7, Calif.



# PFIZER

*Manufacturing Chemists Since 1849*

barns may become its most important outlet, lindane has many other uses in the field of livestock parasite control. Recently New York's dairy industry, which provides nearly half the agricultural income of the state, was threatened with serious losses from cattle mange, a disease caused by minute spider-like mites that invade the skin. Mange may cause only a mild skin irritation but in many cases serious skin lesions become generalized, infected cattle drop rapidly in production, and a small percentage die. Lindane at a very small dosage controls mange for several months. Its use keeps cattle comfortably free of both lice and mange and assures normal production.

During the winter of 1948-49 Ivan G. Howe, Director of New York's Bureau of Animal Industry, supervised a mange control campaign during which 110,000 dairy cattle and calves were treated with lindane for mange control. One and a half pounds of 25 per cent lindane wettable powder were used in 100 gallons of spray and two gallons applied to each cow. The whole treatment cost about seventy cents an animal, or the amount a dairyman receives for six to seven quarts of milk. Negligible lindane residues were found in the milk for two or three days after each spraying. Dairy men were so well pleased that many intend to continue lindane treatment each year, even if only for protection from cattle lice.

Swine also suffer from mange caused by mites almost identical to those found on cattle. A mangy pig is the picture of misery. Encrusted with scabs, his hide thickens. He becomes lame as hardened skin makes movement painful. His carcass is nearly worthless on the market because of emaciation and the many red spots that will remain on cuts such as hams and bacon that are sold with the hide on. One thorough application of lindane spray will put a mangy hog on the road to recovery and two applications a week to ten days apart will insure a cure in most cases. If lice are present, they will also be eradicated.

There has been much discussion about the possible occurrence of off odors and flavors in the meat of lindane-sprayed animals. Most recommendations include the warning that spraying should be finished at least 30 days before slaughter. These warnings probably are a carry-over from the time when only crude benzene hexachloride containing the odorous beta and delta isomers was available. There were reliable reports of tainting in both cattle and sheep when this material was used. But lindane has only a faint

odor and none of it apparently is imparted to meat or milk when recommended dosages are used. Robert Holland of Cornell's Dairy Industry Department has found milk from lindane sprayed cattle free of chemical flavors or odors.

Lindane is the preferred material for use against sheep scab. Scab, once the most serious scourge of North American flocks, is caused by mites that live in the wool. Practically all infected animals die unless treated. Vigorous



Lindane spray for fly control in barn.

control work by state and federal agencies has made sheep scab almost a rarity, but sporadic outbreaks still occur. Lindane will cure scab in one application whereas the old lime sulphur treatment required at least three dippings in hot material.

#### LINDANE FORMULATIONS

Like most of the new insecticides lindane is adaptable to several formulations but the wettable powders and emulsifiable concentrates are the most useful. The wettable powders consist of lindane, an inert dust diluent such as clay, talc, or pyrophyllite, and a wetting agent. They mix with water readily and stay in suspension reasonably well if some agitation is provided in the sprayer tank. Most of them have insufficient wetting agent for livestock use and are difficult to get into the hair unless sprayer pressures of at least 300 pounds are used. Most of the wettable powder formulations now offered are designed for use either on animals or on barn walls. It is probably impossible to adjust the percentage of wetting agent to meet the

requirements of both uses. If enough is added to insure rapid wetting of animal hair, then excessive run off will occur on walls. Separate formulations would be the best solution but formulators prefer to market an all-purpose mix whenever possible.

The emulsifiable concentrates are prepared by dissolving lindane in an organic solvent such as xylene and adding an emulsifying agent such as one of the Tritons in sufficient quantity that a stable emulsion is formed when water is added. No agitation is required to keep the emulsions from separating and they are, therefore, the most useful formulation for the small operator with a hand sprayer. Lindane in this form will control flies in a barn for six weeks while the wettable powder at the same lindane dosage wears out in three to four weeks.

Two additional formulations of lindane are being widely distributed. A simple solution containing about one per cent of lindane in a cheap organic solvent is offered by one company for use against poultry lice and mites. It is painted on poultry roosts in the evening and heat from the bodies of the roosting birds vaporizes the lindane and fumigates the feathers. A vanishing cream containing 1 per cent lindane is on the market and provides excellent control of human scabies or "itch."

Both lindane and toxaphene were recommended by the U. S. Department of Agriculture last month for control of a number of livestock parasites. Lindane is now recommended as a spray to control lice on dairy cows and lice and ticks on other cattle. A concentration of .03 per cent is recommended for louse control. Used alone, it provides protection against certain ticks for a week or ten days; at .025 per cent, in combination with .5 per cent DDT, protection up to two or more weeks is obtained.

A dip containing .02 per cent lindane will control lice and sheep ticks on goats and sheep, while a .03 per cent spray gives good control of sheep ticks in warm weather.

#### OTHER INSECTICIDES

DDT, toxaphene, chlordane, and methoxychlor all are useful against certain external parasites. Each of them will control horn flies, or cattle lice, and chlordane is probably as effective as lindane against hog mange and both types of cattle mange. In tests at Cornell chlordane kept houseflies out of dairy barns longer than lindane and at a lower cost. But chlordane and toxaphene are in the same category with DDT so far as dairy



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uses are concerned. The U. S. Food and Drug Administration will not sanction their use around milk. This is due in part to toxicity, and in part to the lack of accurate analytical methods for detecting their presence.

At present methoxychlor is the only highly effective material that can be recommended for horn fly control on dairy cattle. It is one-tenth to one-twelfth as toxic as DDT and lacks the latter's tendency to accumulate in body tissues. DDT of course must not be used on dairy cattle, in dairy barns, or in milk handling establishments. When sprayed on the cattle, milk residues in excess of 1 ppm may occur. Even when used only on barn walls, fractional ppm of DDT appear in the milk for several days. Recent studies on chronic poisoning by DDT have convinced the Food and Drug Administration pharmacologists that any residue in milk, however small, is a potential health hazard especially to infants. DDT residues in milk are carried almost entirely in the fat constituents. Cream separated from milk containing 1 ppm of DDT may contain nearly 30 ppm.

#### TOXAPHENE TO THE FORE

Toxaphene, formerly called chlorinated camphene, is currently attracting the attention of livestock men because of its apparent effectiveness against several pests, and also because of its comparatively low cost. The Bureau of Entomology and Plant Quarantine of USDA reports that toxaphene is effective in controlling cattle, hog, and goat lice, sheep ticks and fleece worms, and several kinds of cattle ticks including the cattle fever tick. In the Bureau's tests against horn flies on cattle, toxaphene looked almost as good as DDT. Investigations at Cornell during the 1949 season indicated that toxaphene was effective against DDT-resistant houseflies but not as long lasting as chlordane or lindane. In the emulsifiable concentrate formulation, toxaphene sells for one-tenth the cost of lindane, and one-sixth that of chlordane.

In its latest recommendations, the USDA gives recognition to the effectiveness of toxaphene by recommending it for control of ticks, lice and horn flies on all livestock except dairy cows. It is also recommended for sheep tick control. Sprays of .5 per cent are suggested for ticks and lice on cattle and swine and for horn flies, while dips containing as little as .1 per cent are suggested for lice on sheep and goats and sheep ticks. Toxaphene provides two to three weeks protection against reinfestation.

Toxicity of the hydrocarbon insecticides to domestic animals is an important consideration. DDT and methoxychlor apparently are safe in any dosage likely to be used, but lindane, chlordane, and toxaphene are absorbed in dangerous quantities when sprays or dips of one to two per cent concentration are applied. Young calves are particularly susceptible to these materials. In tests made at the U. S. Bureau of Entomology and Plant Quarantine Laboratory at Kerrville, Texas, suckling calves were occasionally killed by single applications of sprays containing .05 per cent gamma isomer of benzene hexachloride, 1 per cent of chlordane, or 1 per cent of toxaphene. Other calves in the same tests were unaffected, and a few showed temporary symptoms.

The margin of safety between insecticidal and toxic dosages is small, especially for lindane, which must be used at the .046 level to control mange. Under these conditions small errors in measuring either water or toxicant can result in injury or death to treated animals. However, during the mange control campaign in New York several hundred calves of all ages were sprayed twice with .046 per cent lindane without injury. Chlordane and toxaphene must be used at the .5 per cent level for control of ticks and only twice this amount may injure or kill young calves. Older cattle and most other farm animals are more tolerant of these materials. By contrast DDT and methoxychlor appear to be safe at levels as high as 8 per cent, while 5 per cent is the highest dosage commonly recommended. It is well known that straight oil solutions of any of the hydrocarbon insecticides are far more dangerous than similar amounts in suspension or emulsion. They are never recommended for livestock.

#### IMPORTANCE OF PACKAGING

When dosages must be measured with great accuracy, package type and size become important. Only 1½ pounds of 25% lindane wettable powder are required to make 100 gallons of .046 gamma spray. Careful spray operators weigh their material but others estimate by pouring from packages containing known weights. Such rough estimates for lindane will be more accurate if made from one pound packages than if from four or 24 pound ones.

Formulators can help by frequently checking package filling equipment. In 1948 a well known supplier sent out some one pound packages that contained various amounts from 14 to 16 ounces. Using an improved container

the same company is now distributing one pound packages, some of which contain 17 ounces. Such errors can discredit a good material and in the case of over weights cause serious production losses in a commodity wholesaling for \$3.00 a pound.

The emulsifiable concentrates must be packed in glass or metal containers. Metal is the favorite but some of the containers rust or corrode and the products of this corrosion sometimes break down the emulsions. When this happens a large part of the contents is a straight solution of the insecticide in high concentration. Such material will float on top of a dipping tank and animals will be treated with several times the intended dosage. Losses have been caused by this chain of circumstances. Corrosion-proof metal containers are now available for most of the concentrates.

#### MARKET POSSIBILITIES

Prospective manufacturers or formulators of insecticides should not expect their major profits from livestock uses. Most of those now in the field slant their sales and development programs toward cotton, citrus, and deciduous fruit. Grasshoppers are good consumers of several materials in outbreak years like 1949. But all of New York's 1,400,000 dairy cattle can be sprayed twice with 11 tons of lindane, or about one-fourth of the principal manufacturer's reputed monthly output. Another 5 tons will spray her dairy barns and New York is one of the 10 largest dairy states.

Accurate figures on the consumption of livestock insecticides in the entire country are not available, but they probably would not invite the addition of many new suppliers. Development of new materials is no longer the inviting venture it was during the early days of DDT. New insecticides must be tested over a period of years, on various crops, and animals, and their toxicities to man and animals determined.

Competition is severe. During the past five years a large number of chemical, drug, oil, feed, fertilizer, and paint companies have gone into insecticide development, formulation, or sales. Two of the better known ones recently bowed out of the bug killing business, one in part and one entirely. The latter had been a major distributor for at least 20 years, good evidence that the field is overcrowded. During the same five year period only one sizable corporation has been organized solely to develop, manufacture, and sell new insecticides and it represents a secession from an older concern.

**90% PURE MONOESTER CONTENT**

# MYVEROL

## DISTILLED MONOGLYCERIDES

Myverol Type 18-05 Glyceryl Monostearate, a flaked solid made from triple-pressed stearic acid.



DPI now makes available to the drug and cosmetic industry the most powerfully dispersing monoglycerides ever offered in commercial quantities. With minimum monoester content of 90%, 2 to 3 times the purity of ordinary monoglycerides, Myverol Distilled Monoglycerides offer exciting new possibilities in the compounding of new cosmetic emulsions.

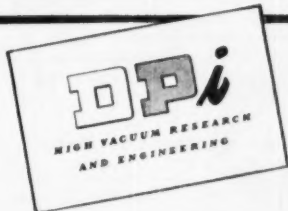
"Myverol" is a trade-mark identifying high-potency monoglycerides, as produced by Distillation Products, Inc.

The greater effectiveness of this material as a surface-active agent can also lead to profitable improvements in appearance, texture, stability, and longer-lived freshness of many products.

Myverol Distilled Monoglycerides are uniformly odor-free, catalyst-free, and soap-free—a uniquely pure material that will be incorporated into many fine products that the coming years will reveal.

### SEND FOR SAMPLES

along with specification sheet and quotations. Experiment with this remarkable new emulsifier. Results will challenge your imagination with the possibilities it offers in the development of your product line. Write, wire or phone.



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Gillies & Loughlin, Los Angeles and San Francisco

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Sodium Salt

Butyl Ester

Isopropyl Ester

40% Butyl Ester Sol.

44% Isopropyl Ester Sol.

Amine Salt Solution

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100% technical grade

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dust concentrates

emulsifiable solutions

## KOLKER

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*Manufacturers of  
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## SPECIALTIES NEWS

### NAIDM Becomes CSMA, Elects Oppenheimer

The National Association of Insecticide and Disinfectant Manufacturers officially became known as the Chemical Specialties Manufacturers Association (*CI*, July, 1949, p. 36) at the 36th annual meeting held last month at the Mayflower Hotel, Washington, D. C. L. J. Oppenheimer, West Disinfecting Co., formerly vice-president of the organization, was elected president of the newly named and re-organized group to succeed Gordon M. Baird, Baird & McGuire.

This leading trade association of the chemical specialties field is now composed of five divisions: aerosol; disinfectant and sanitizers; insecticide; soaps, detergents and sanitary chemicals; and waxes and floor finishes.

Other new officers include C. L. Weirich, C. B. Dudge Co., elected first vice-president; P. C. Reilly, Jr., Reilly Tar & Chemical Co., and H. W. Hamilton, of the New York company of the same name, re-elected treasurer and secretary, respectively.

### New Lindane Plant for Commercial Solvents

A new insecticide plant for the large-scale production of lindane, the pure gamma isomer of benzene hexachloride, is to be constructed at Terre Haute, Ind., by Commercial Solvents Corp. This unit will be located adjacent to the present benzene hexachloride plant and will utilize the latter's production of technical grade material for the extraction of the gamma isomer. The present plant is to be expanded to effect an estimated increase in production of twenty-five per cent and will permit the continued marketing of the technical product. Both projects are estimated to cost about \$500,000.

It is expected that expansion of the present benzene hexachloride plant will be completed within six months, while large-scale production of lindane will be under way within a year.

### Pennsalt Adds Sours Unit To Calvert City Plant

A new plant for the continuous process manufacture of its Erusto Laundry Sours is now being constructed by the Pennsylvania Salt Manufacturing Co. as the first addition to its \$2 million plant recently put in operation at Calvert City, Ky.

This addition was contemplated in the original plans for the Calvert City operation. It is the first in a series, now under consideration, designed to use some of

the hydrofluoric acid production as a basic material in the manufacture of Pennsalt's line of fluorine chemicals.

The building will be of conventional brick, steel and transite construction, closely integrated with present plant structures. Both the building and layout of production equipment were designed by the Central Engineering Department of Pennsalt. Total estimated cost of the project is \$250,000.

Preliminary work was started late last November and the plant is scheduled to be in operation by June 1, 1950.



C. G. Gran (left), appointed manager, agricultural sales development, Mathieson Chemical Corp., and Clarence J. Krueger, new production manager for the paint division of Pittsburgh Plate Glass Co. Mr. Gran was assistant to the president of the American Plant Food Council, Inc.; Mr. Krueger has been assistant divisional director of Pittsburgh's Ditzler Color Division.

### P & G Plans Research Lab At Venice, Ohio

The Procter & Gamble Co. is planning to construct a new \$1.5 million research building near Venice, Ohio.

The two-story research building will house modern research equipment and laboratory facilities and will permit a material increase in the company's research and development activities. The general plan is completed and preliminary engineering on the building is well underway. It is hoped that the building will be ready for occupancy in about two years.

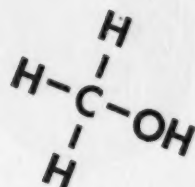
The new building will be situated on a 200 acre tract of land which the company acquired last April.

In extending its laboratories to an outlying area, P. & G. is following the practice which many industries have found desirable in that it permits the proper part of its research and development work to be separated from its manufacturing activities.

### Ohio Adhesives Completes New Plant

Ohio Adhesives Corp. has just completed construction of its new adhesive plant at New Philadelphia, Ohio. This factory manufactures resin and rubber

# CELANESE<sup>\*</sup> METHANOL



- TANKER, BARGE, TANK CAR, DRUM
- IMMEDIATE DELIVERY
- HIGHEST QUALITY

A dependable source for regular and continuous supply. Celanese Methanol—top grade in quality—is available in any amount from tankers to drums.

## SPECIFICATIONS

Methanol Content . . . . .	99.85% min.
Specific Gravity @ 15/4°C. . . . .	.7962 max.
Distillation Range . . . . .	1.5°C. max.
Appearance . . . . .	Clear and free of suspended matter in transmitted light
Odor . . . . .	Characteristic and free from foreign odors
Color . . . . .	5 APHA <sup>†</sup> max.
Acidity and Alkalinity . . . . .	Not acid to methyl orange nor alkaline to phenolphthalein
Potassium Permanganate Time . . . . .	30 minutes min.
Sulfuric Acid Wash Test . . . . .	Not darker than .000125N iodine solution
Acetone Content . . . . .	.03% max.
Hydrocarbons . . . . .	None
Non-volatile Material . . . . .	.001% max.

<sup>†</sup>American Public Health Association Standard

For additional information concerning methanol, write for Bulletin No. S-03-I.  
Celanese Corporation of America, Chemical Division, Dept. 52-A, 180 Madison Ave., N.Y. 16



<sup>\*</sup>Reg. U.S. Pat. Off.

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## CHEMICAL SPECIALTIES

adhesive for the industrial, automotive, and building trade.

## **Armour Now Selling ACTH**

Armour and Co. is now selling its new drug, ACTH, to investigative clinics. Prior to the first of the year, ACTH had been supplied free of charge to the clinics. It has not been available for private use and probably will not be for some time to come.

ACTH, extracted from the pituitary glands of hogs, is the hormone which stimulates the cortex of the adrenal gland to secrete other hormones. Clinically, it has shown its ability to reverse the course of such serious diseases, hitherto unamenable to treatment, as arthritis, gout, leukemia, lupus erythematosus, myasthenia gravis, rheumatic fever and several others. It is still in an early stage of investigation.

## **Sterling Buys Puhl Stock**

Sterling Drug, Inc., has acquired all the issued and outstanding stock of the John Puhl Products Co., Chicago, in exchange for 36,000 shares of its own common stock. The transfer extends Sterling's interest in the cleaner field. (Energene Cleaner Fluid is its product.) The products of the Puhl company are Fleecy White Bleach, Little Bo-Peep Ammonia and Little Boy Blue Bluing.

Distribution of the Puhl products is primarily in the Mid-West and South, but Sterling plans to extend their distribution to other parts of the country through additional manufacturing facilities in other areas.

## **Standard for Polystyrene Tiles, Adhesives**

A recommended commercial standard for polystyrene plastic wall tiles and adhesives for their application has been submitted by the Commodity Standards Division of the National Bureau of Standards to manufacturers, distributors, users and other interested groups for their consideration and acceptance.

A limited number of mimeographed copies of the recommended standard are available upon request to the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

## **Cortisone Distribution To Be Widened**

Merck & Co., Inc., believes that its increased production of Cortisone in the first half of 1950 will be sufficient to enable it to supply various teaching medical centers with limited quantities for research purposes. Cortisone, which shows promise for relief of certain types of arthritis, acute rheumatic fever, and certain other conditions, is expected to be

available shortly at a lower price as a result of savings which have been achieved in production.

After basic research demands are met priority will be given to the requirements of teaching medical institutions in the United States and Canada and to appropriate research centers under Government supervision.

Cortisone has not yet been released by the Food and Drug Administration for general distribution and can be shipped only for purposes of investigation.

## **Tanning Research Award**

A \$25,000 contract has been awarded by the Quartermaster General of the Department of the Army to the Tanners' Council Research Laboratory at the University of Cincinnati for research in synthetic substitutes for scarce oils and fats used in the tanning of leather.

Fred O'Flaherty, U. C. Professor of Applied Science in Tanning Research, and head of the laboratory, will direct the research, which is to continue during the next two years. It will be primarily concerned with analyzing and testing the effects of synthetics developed at the laboratory, and with microscopic studies of leather treated with synthetics.

## **Company Notes**

• **The Dewatex Manufacturing Corp.**, New York 18, N. Y., has formed an Asphalt-Seal Division to take over the sales and distribution of its newly developed product Asphalt-Seal. It has issued a twelve page catalog describing the use of the new material for painting and weatherproofing asphalt side-walls and roof shingles.

• **L. J. & M. Laplace**, Hackensack, N. J., has broken ground for a new plant on a 5-acre site in East Paterson, N. J. In addition to affording better facilities for distribution of its line, it will enable the company to expand manufacture of inks, coatings, etc. Estimated cost of construction is \$100,000.

• **Glyco Products Co., Inc.**, Brooklyn, N. Y., and Natrimum, W. Va., has moved its offices to the Tribune Tower Building, 435 N. Michigan Ave., Chicago.

• **S. P. Penick & Co.** has just negotiated a long term lease for its Chicago branch office and plant at 735 West Division St., which premises it has occupied for the past ten years.

• **Warwick Wax Co., Inc.**, has appointed two distributors for its microcrystalline Mekon waxes, emulsifiable Cardis waxes and sugar cane wax:

The E. S. Browning Co., Division



# Black Magic?

*Almost!*

## ... the way Pittsburgh Granular Activated Carbon meets Adsorbent Problems

The strange adsorptive power and almost unbelievable selectivity and capacity make Pittsburgh Granular Activated Carbon ideal for gas and liquid phase adsorbent applications. Its uses include solvent recovery, air and water conditioning, catalysis, catalyst support, chemical purification and antibiotic isolation. Chemically stable and readily regenerated, it has high density and good abrasion resistance. Activity characteristics are carefully controlled for specific application. It is economically produced from selected raw materials as part of integrated Pittsburgh Coke & Chemical Company operations.

This granular carbon is offered in 10 basic grades and in sizes from 4 to 30 mesh (finer sizes for special cases). A complete line of pulverized activated carbon is also available.

Whatever use of an adsorbent is indicated, in refining, manufacturing or processing, Pittsburgh Activated Carbon may offer advantages of economy and efficiency. Your inquiries are invited.



Activated Carbon Division

**PITTSBURGH COKE & CHEMICAL  
COMPANY**

1952 Grant Building, Pittsburgh 19, Pa.

OFFICES: New York San Francisco Tulsa Houston

COAL CHEMICALS · ACTIVATED CARBON · NEVILLE COKE · EMERALD COAL · PIG IRON · GREEN BAG CEMENT · CONCRETE PIPE AND PRODUCTS

## Pittsburgh Activated Carbon Solves Process Water Problem!



An extremely concentrated solution of a chemical is pumped into a large plastic pipe. Pittsburgh Granular Activated Carbon, loaded in a specially designed filter, brings the variable water content. When regeneration is required, the carbon is removed and replaced.

## CHEMICAL SPECIALTIES

of Innis Speiden Co., will have exclusive distribution in California, Oregon and Washington.

Sole distribution in Georgia, Florida, Alabama and Mississippi, will be handled by the L. C. Morris Co.

### Personnel

• **Procter & Gamble** has appointed H. S. Cole as manager of its Drug Products Division. He succeeds Harold R. Hall, who has accepted the position of Research Fellow and member of the faculty of the Graduate School of Business Administration of Harvard University.

• **John J. Derrig** has been appointed sales manager of the New England territory for the Textile Resin Department of **American Cyanamid Co.** For the past five years he has been technical salesman for the metropolitan territory.

• **Norman C. Moore**, of Portland, Ore., has been appointed manager of a newly-created sales district of **Abbott Laboratories** in the Northwest. Headquarters of the district are in Portland.

• **Daniel H. Terry**, since September, 1945, a process development chemist in the company's Grasselli, N. J., plant, has been made manager, Technical Service for **Antara Products, General Aniline & Film Corp.** Dr. Terry, who was a research chemist for E. I. du

Pont de Nemours & Co. from 1940 to 1945, investigated such problems as preparation of miscellaneous intermediates, vitamins and hormones, detergents and water repellents.

• **George S. Forbes** has been named manager of the **Glidden Co.'s** Cleveland Industrial Sales Division. He succeeds **Edward C. Shurtleff**, who has retired after 46 years' service with the firm.

• **J. Murray Scott** has been named medical director of **Sharp & Dohme, Inc.** **J. William Crosson**, who formerly held this post, has been named to the newly-created position of medical administrator.

• **Joseph B. Dietz** has been named manager of the industrial sales section of the Finishes Division of the **Du Pont Co.** He succeeds **Henry E. Lackey**, who is retiring after a career of nearly 43 years.

• **D. C. Berry**, advertising manager of **McKesson & Robbins, Inc.**, has been promoted to vice-president in charge of advertising.

• **Arthur W. Etchells**, of Hellwig Dyeing Corp., Philadelphia, and **George O. Linberg**, of Monsanto Chemical Co., Boston, have been elected vice-presidents of the **American Association of Textile Chemists and Colorists.**

The vice-presidents-elect will serve under **C. Morris Raybold**, of Erwin Cotton Mills, Cooloomee, N. C., president.

## NEW CHEMICAL SPECIALTIES

*Note: This section limited to new finished specialties. New raw materials and intermediates of interest to specialties manufacturers are described in New Products and Processes department.*

### Rust Inhibitor

**New rust inhibitor for light oil products effective at 0.002%.**

A new rust inhibitor for light oil products in pipe lines and static storage is available from **Monsanto Chemical Co.**, St. Louis 4, Mo. A hydrocarbon-soluble, water-insoluble, non-metallic organic material, it will be sold under the trade name **Santolene C** and is intended to be used in such products as gasoline, fuel oil and kerosene.

The new product is sufficiently effective at a dosage of 0.002% by weight, or 0.75 gallon per 1,000 barrels, when tested according to modified ASTM D-665-47T against distilled water. Concentrations up to 0.01% may be necessary against sea water. Initial results of pipe-line tests underway with **Santolene C** look promising.

Treating cost with **Santolene C** at 0.002%, with a displaced fuel credit of 10 cents per gallon, is said to be about 0.14 cents per 42 gallon barrel.

### Waterproof Adhesive

**Quick adhesion to all surfaces feature of new adhesive.**


Floor and wall coverings are said to adhere to difficult surfaces including "green" concrete with **Mast-Arc Adhesive 1071-33D**, a new product of **American Resinous Chemicals Corp.**, 103 Foster Street, Peabody, Mass. Because of its quick grab, the adhesive is particularly valuable for application on vertical surfaces. A permanent, durable, flexible bond is obtained even when used on painted, enameled, lacquered and waxed surfaces. In addition, the adhesive is extremely waterproof. It is available to adhesive manufacturers and distributors.

### Fuel Oil Additive

**New ingredient eliminates filter screen clogging in oil burners.**

A new fuel oil ingredient called **FOA-5X**, which virtually eliminates filter screen clogging in oil burners, has been discovered by **Shell Oil Co.** For years, such clogging has been the most common cause of oil burner shutdown requiring emergency service.

All domestic heating oil processed at **Shell refineries** for the 1949-50 heating season will contain **FOA-5X**. In thousands of installations now operating ex-



**WH&C**  
**Chemical Specialties**

**LECITHIN**  
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**FATTY ACIDS**

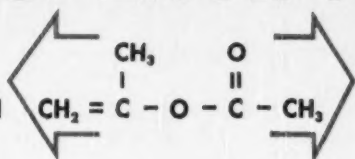
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# ISOPROPENYL ACETATE

ESTER EXCHANGE

COPOLYMERIZATION



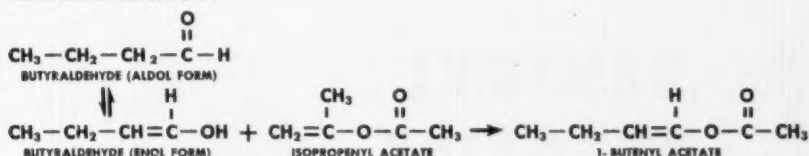
ANHYDRIDE FORMATION

ENOL ACETYLATION

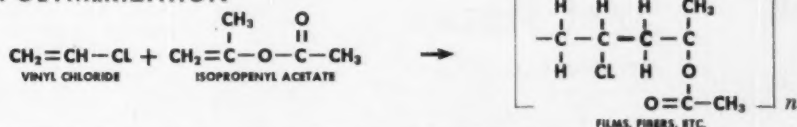
Isopropenyl acetate, available in pilot-plant quantities, offers the chemical industry a unique combination of excellent acetylation properties, similar to those of ketene, plus a double-bond system. A stable chemical, isopropenyl acetate is easily shipped and handled under ordinary conditions. Write for samples and further information to TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSFORD, TENNESSEE.

TYPICAL REACTIONS

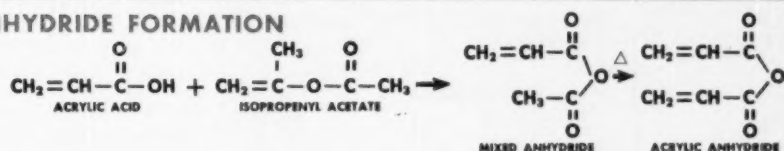
## ENOL ACETYLATION



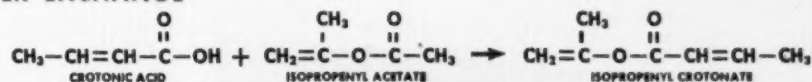
## COPOLYMERIZATION



## ANHYDRIDE FORMATION



## ESTER EXCHANGE



## EASTMAN INDUSTRIAL CHEMICALS

REPRESENTATIVES: New York—10 E. 40 St.; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave. • West Coast: Wilson & Geo. Meyer & Co., San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S.W. Sixth Ave.; Seattle—1020 Fourth Ave., So.

## CHEMICAL SPECIALTIES—

clusively with the new type oil, not a single case of oil burner failure due to a clogged filter screen has been reported.

The new ingredient acts by keeping infinitesimal substances that coagulate to clog filter screens in suspension, and preventing formation of sludge. It also retards the formation of rust and scale in users' tanks.

### Drug for Arthritis

**Glucuronolactone, drug for rheumatic diseases, commercially available.**

A new drug, glucuronolactone, which has shown significant results in combating arthritis and related rheumatic dis-

eases during two years' investigation, is now commercially available from C.S.C. Pharmaceuticals, a division of Commercial Solvents Corp. It will be marketed in tablet form for oral use under the trade name Glucurone.

Synthesis of this form of glucuronic acid was achieved by Corn Products Refining Co. whose present production, while still on pilot-plant scale, is sufficient for present potential requirements.

### Fungicidal Enamel

**Long-lasting fungicidal enamel developed for food processing plants.**

A high gloss enamel that controls mold

and mildew growths during its service life has been developed by the Glidden Co., 11001 Madison Ave., Cleveland, O., for use in dairies, bakeries and other similar food processing plants. Called San-I-Seal, the new product contains a water insoluble fungicide that does not evaporate or leach out. It dries to a hard, firm surface that will not soften from moisture and allow dust containing food particles, on which fungus spores feed, to adhere to the surface.

Although designed primarily for interior use, San-I-Seal may be applied to exterior surfaces—if the exposure is not severe, such as on ceilings of loading platforms—without affecting its fungipreventive qualities. It is extremely washable. It is produced only in white, although it may be tinted if desired, and can be either brushed or sprayed on the surface. One coat is usually sufficient on previously painted surfaces.

### Aerosol Aluminum Paint

**Low-pressure aerosol dispenses aluminum enamel.**

Chase Products Co., Maywood, Ill., has developed a low-pressure aerosol for applying aluminum paint. Its SprayPak Chrome Aluminum Enamel is suitable for spraying radiators, pipes, furnaces and other surfaces of wood, metal, or stone by merely pressing the release button after shaking the can to activate the agitator contained therein and insure suspension of pigment. It is held 12 to 16 inches from the object to be painted.

The can contains 11 ounces by weight, sufficient to cover 75-150 sq. ft., depending upon the surface. The propellant is Freon 12. It sells for \$1.39 a can.

### Non-Corrosive De-Icer

**Mixture of salt and rust inhibitor used to de-ice highways.**

More than one hundred cities and towns are said to plan to use a new rust-inhibiting chemical "Banox," a product of Calgon, Inc., Pittsburgh, mixed with de-icing salt in clearing streets and highways for traffic this winter. Most municipal users plan separate purchases of salt and Banox—a dry powder—to mix it themselves. But the Carey Salt Co., Hutchison, Kan., has begun offering a new pre-mixed salt product containing the rust-preventive chemical, and other salt companies are expected to follow suit.

Banox, which is added in small amounts (1%) to de-icing salt, was developed for rustproofing automobiles, household appliances, outdoor furniture, other metal products prior to finishing. But a public-works engineer, Service Director M. L. Davis of Akron, Ohio, who was looking for a rust-inhibiting additive for salt to quiet motorists complaining that salt

# BENZOYL PEROXIDE

**SPOT STOCKS  
in Metropolitan**

- ★ *New York*
- ★ *Chicago*
- ★ *Los Angeles*

*Chemical Division*  
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CHEESE SPREADS  
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MEAT SAUCES  
CANDY GELS  
BAKERY ICINGS  
TOPPINGS  
MERINGUES  
PIE FILLINGS  
BAKERY GLAZES  
JELLIES AND SYRUPS

## ★ PHARMACEUTICALS and COSMETICS

EMULSIONS AND SUSPENSIONS  
JELLIES AND OINTMENTS  
SHAMPOOS  
DENTIFRICES  
SHAVING CREAMS  
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## ★ INDUSTRIAL

PAPER COATINGS  
PAPER SIZING  
TEXTILE PRINTING PASTE  
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ADHESIVES  
CERAMIC GLAZES  
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CLEANING COMPOUNDS  
DETERGENTS  
LATEX CREAMING AND THICKENING  
LEATHER FINISHING COMPOUNDS  
FIRE RETARDING COMPOUNDS

In ever-expanding applications, Kelco Algin is proving its superiority as a stabilizing, suspending, emulsifying, thickening, gel-producing, and film-forming agent.

This growing preference for Kelco Algin is a direct result of its unique and effective hydrophilic colloidal properties — plus its ready availability, economy, uniformity and versatility.



# KELCO

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COMPANY

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Cable Address: Kelcoalgin, New York

was rusting their fenders, tried it and found it the answer to his problem. Several cities promptly followed Akron's cue and adopted Banox for the 1948-9 snow season, and Davis has become something of a hero among public works men.

### Odor-Reducing Agents

New line of materials developed to reduce unpleasant industrial odors.

The Chemical Division of 44 Trinity Place Corp., 44 Trinity Place, New York, N. Y., has developed a new line of materials which it claims works by a new principle to reduce unpleasant industrial odors. They are said not to mask undesirable odors but to reduce them to a

point where only a slight identification odor remains.

Formulations are effective for such products as tall oil, fish liver fatty acid, petroleum products, naphthenic acid, linseed oil, etc. Color retention and color reduction and rancidity inhibition as well as odor reduction are claimed with some products. Easy to use, cost is less than  $\frac{1}{8}$  of a cent per gallon of material deodorized.

### New Vitamin B<sub>12</sub> Products

Parenteral and oral grades of new vitamin concentrates marketed.

Two new vitamin B<sub>12</sub> concentrates, of interest to the pharmaceutical industry,

are being marketed by Chas. Pfizer & Co., Inc., Brooklyn, N. Y., in both a parenteral grade solid and an oral grade solid form. Both products, produced by fermentation processes, are stable, dry concentrates.

The parenteral grade solids are designed for use in the manufacture of sterile solutions of vitamin B<sub>12</sub> for parenteral injection; the oral, for use in tablets and capsules. Both are now available in the following package sizes based on the weight of vitamin B<sub>12</sub> in the concentrate according to the L. L. assay method: 1 gram; 500 mg.; 100 mg.; and 10 mg.

### Food Colors

New line of colors marketed to food industry.

A complete line of certified food colors is now being offered by Sterwin Chemicals Inc., New York, N. Y. Seventeen primary food colors and an unlimited number of blends as required by the food industry, all certified for human consumption by the Food and Drug Administration, will be marketed under the brand name of "Parakeet." Distribution packings will range from  $\frac{1}{2}$  ounce envelopes to 200-pound drums.

### Metal-to-Butyl Adhesive

Preparation bonds butyl rubber to metal during molding operations.

A new preparation developed by Dayton Chemical Products Laboratories, Inc., West Alexandria, Ohio, is said to solve the problem of bonding butyl rubber to metal during molding operations, one of today's most difficult adhesion tasks. Applications include vibration-reducing mountings, bumpers, and other molded articles where butyl rubber must be adhered permanently to a metal base.

### Plastic Coatings

New series of industrial plastic coatings in several colors.

Foster & Kester, Philadelphia, makers of the original Krylon plastic spray, have a new series of protective plastic coatings for industry. Known as Krylon #200 Series, they are now available in white, machine gray, and crystal clear.

These coatings all have good bonding characteristics to both metal and wood. Containing a high solid content, they are highly resistant to abrasion and provide a hard, tough finish.

### Deodorizing Compound

Chemical deodorant available in aerosol container.

Odorstroy, a new air deodorizer, which destroys unpleasant odors by chemical reaction, is available in aerosol containers pressurized by Freon-12. By pressing a pushbutton, a fine dry mist of

## ISCOOPERATION News

JANUARY, 1950

### ISCO GUM KARAYA

The story of Gum Karaya is an old one and we here at ISCO have been a part of that story for many years. With each passing year, of our experience with this product of nature, we have learned something new about its peculiarities.

We are now convinced that the many problems connected with this gum can be solved during the production period. We have also found that the exact grading of various lots at the pre-production stage can insure for our many customers a standard uniform product.

During 1949, new production methods were installed in our Plant at Jersey City and now with the start of 1950, we proudly announce the New

Isco Gum Karaya.

The new Isco Powdered Gum Karaya is available in nine different colors, brought about by our exacting Color Control process rigidly maintained by our Staff of Chemists.

Isco Gum Karaya Crystals are now available in various mesh sizes, milled and cleaned to the exact specifications of the most discriminating Buyers in America's far-flung Pharmaceutical industry. The new Isco Gum Karaya is a clean, uniform product and samples of this and all our Powders which find their place in all industry, are available on request.

Let us, as specialists in Gums, quote on your requirements.

**INNIS, SPEIDEN & CO.**

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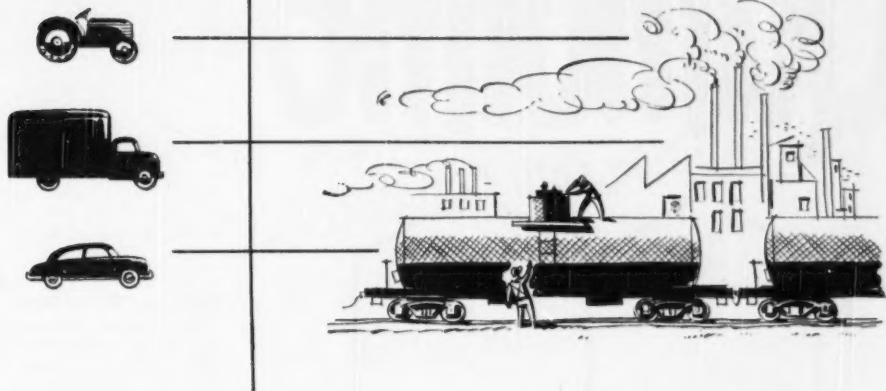
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SUBSIDIARY E. S. BROWNING CO., INC. SAN FRANCISCO • LOS ANGELES



# Dow is a major producer of

## PROPYLENE GLYCOL ETHYLENE GLYCOL



*... essential to permanent-type antifreeze*

Dow supplies propylene glycol and ethylene glycol to numerous anti-freeze producers. Although this represents the major use for glycols, don't overlook the fact that these glycols, along with diethylene glycol, triethylene glycol and dipropylene glycol, point the way to new advances in industrial product improvements.

Advances in hydraulic fluid formulations . . . safer, low-freezing dynamite . . . long distance transmission of natural gas through pipe lines . . . preparation of new, low-pressure, overlay resins and the development of quick-setting printing inks—all these were made possible through the use of glycols.

Look to Dow for *all* your glycol needs. And for further information write Midland for the Dow Glycols technical booklet.

**DOW ALSO PRODUCES** over 500 chemicals including: Caustic Soda, Phenol, Aniline, Hydrochloric Acid, Monochlorobenzene, Propylene Oxide, Epsom Salt, Ethylene Oxide, and other industrial, pharmaceutical and agricultural chemicals.

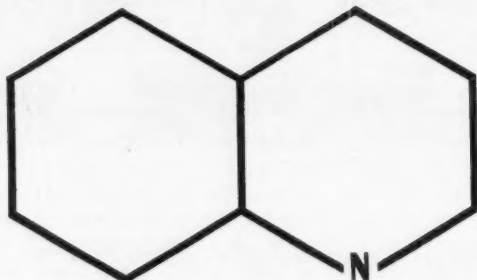
**THE DOW CHEMICAL COMPANY**

MIDLAND, MICHIGAN



# REILLY

# Quinoline



**An interesting organic chemical with many important applications**

QUINOLINE is one of the more important coal tar chemicals produced by Reilly. One of the major applications of QUINOLINE is the production of nicotinic acid. The quinolinic acid produced by the oxidation of QUINOLINE is easily converted to nicotinic acid.

AMINOQUINOLINES are receiving increasing attention in the synthesis of organic compounds. The BZ-aminoquinolines are prepared by the reduction of the corresponding nitroquinolines. The 2-, 3-, and 4-aminoquinolines are obtained by reacting the corresponding chloro- or bromo-quinolines with ammonia or amines.

8-HYDROXYQUINOLINE, a fungicide of increasing importance, is made by caustic fusion of the quinoline sulfonic acid. Other applications of QUINOLINE include the manufacture of antiseptics, antipyretics and other pharmaceuticals, dyes, insecticides and rubber accelerators.

Reilly offers two grades of QUINOLINE—90% and 95% minimum purity. Both grades are available in quantity.

Your inquiry concerning QUINOLINE or any of the many other Reilly coal tar bases, acids or hydrocarbons will have prompt attention.

*Reilly Coal Tar Chemicals For Industry*

**REILLY TAR & CHEMICAL CORPORATION**

Merchants Bank Bldg., Indianapolis 4, Ind.

500 Fifth Avenue, New York 18 • 2513 S. Damen Avenue, Chicago 8

## CHEMICAL SPECIALTIES—

Odorstroy penetrates throughout enclosed spaces, destroys odors within five seconds, and remains in the air for prolonged effectiveness.

Odorstroy is non-inflammable, non-toxic, non-corrosive, non-irritating, and non-staining. A bulletin giving details is available from the American Instrument Co., Inc., Silver Spring, Maryland.

### Cellulose Acetate Cement

**Liquid cement for bonding cellulose acetate.**

A new liquid cement for bonding cellulose acetate objects is being introduced by Schwartz Chemical Co., Inc., 326 West 70 Street, New York 23, N. Y. Simply called "Acetate Cement," the new solvent mixture is said to be far less volatile than acetone, does not require a fire department permit, and can be stored safely in unlimited quantities. It is said to evaporate slowly enough to prevent blushing, and to insure good penetration and an excellent bond, in which respects it is superior to acetone.

### No-Rinse Detergent

**New laundry detergent suspends dirt, makes rinsing unnecessary.**

Even the most earnest New York housewife who wants to save water wouldn't consider washing her clothes without rinsing them—but such a practice is feasible, according to Lever Bros., now marketing its new No-Rinse Surf in Philadelphia, Chicago and Los Angeles. The detergent, due for national distribution as production facilities expand, is described as a general household cleansing agent which, when used in laundering, holds dirt in constant suspension in the wash water as it removes dirt from clothes. Hence, claims Lever, when the wash water is wrung or spun out, there is no redeposit of dirt on the clothes.

Principal advantages attributed to No-Rinse Surf, in addition to conservation of water, are the saving of time and labor, as well as that of hot water, in homes where heating water is a problem. Further credits proved in U. S. Testing Co.'s tests: retention of whiteness, color brightness and tensile strength (less hardening of clothes); and low bacteria count.

### Electric Deodorizer

**Deodorant cakes in electrical deodorizers marketed for air freshening.**

Odor-Ban electric deodorizer, a product of Cauhon Distributing Co., 9999 Broadstreet, Detroit, is being sold to kill disagreeable odors in plants and offices. Deodorant cakes are inserted in the electric unit, the heat from which causes the active material to disperse into space, killing odors. They come 50 cakes to a

**NOTES**

FROM THE

**NUCHAR**

*purification notebook*

**Did you know that there are  
120,000,000,000 particles  
in every gram of Nuchar  
Activated Carbon?**

Think of it! There are about 120 billion particles in one gram of Nuchar Activated Carbon and every particle is a veritable honeycomb bristling with active surfaces. Nuchar's amazing power to adsorb impurities is due chiefly to this tremendous surface area together with its inherent structural make-up and lattice-work pattern of "active patches."

Our Activated Carbon Technicians will gladly cooperate with you on any or all of your problems concerning odor, taste and color removal. They can show you how to get optimum results with Nuchar Activated Carbon in your process.

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**division west virginia pulp and paper company**

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Leader Bldg.  
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SNOW TOP PRECIPITATED CALCIUM CARBONATE • LIQRO CRUDE TALL OIL  
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SULFATE WOOD TURPENTINE • ALPHA PINENE • BETA PINENE • POLYCEL CELLULOSE FIBERS  
INDULIN (LIGNIN)

# Refined CRESYLIC ACID

## Petroleum...Low-boiling

**Now available  
in tank cars and  
barrels**

### Distillation Range

5% . . . . . 193°C.

95% . . . . . 215°C.



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#### CHEMICAL SPECIALTIES

jar at \$2.50 a jar, with lower prices for larger purchases. The electric unit retails for \$1.25, but is cheaper in larger lots.

#### **Thermosetting Adhesive**

**Multi-purpose adhesive contains no solvent, does not shrink, nor swell.**

A new thermosetting resin compound, Armstrong's Adhesive A-1, is being manufactured by Armstrong Products Co., 364 North Broadway, Burket, Ind. It joins metals, glass, ceramics, plastics, wood and numerous other rigid materials to themselves and to each other.

Armstrong's Adhesive A-1 contains no volatile solvent and does not shrink or swell upon hardening. Thus it can be used as a gap-filling material, and materials to be bonded together may be assembled immediately after application of the adhesive.

The adhesive begins to cure as soon as the activator is mixed with the resin composition. Two activators—one for a fast cure and one for slow setting—are available for use with the product. Heating accelerates the cure.

It is available in pint, quart, gallon and five-gallon pails. A generous kit, at a nominal charge of \$1.00, is made available to those who wish to make their own tests of this new product.

#### **Burnishing Compound**

**Utility on all metals main advantage of new compound.**

Chemclean Products Corp., 64 Sixth Avenue, New York, has a new burnishing compound called Burnish-All. Its outstanding advantage is that it can be used on a variety of metals. Burnish-All is equally effective when used either with burnishing medium or in self-rolling operations. Packing is in 325-lb. barrels.

#### **Resin for Wet Strength**

**New type resin said to be superior for wet-strengthening paper.**

A new paper wet-strengthening resin, reportedly with advantages over urea and melamine resins now used for this purpose, has been developed by the Plaskon Division of Libbey-Owens-Ford Glass Co., Toledo, Ohio. The new resin, though neither a straight urea nor a melamine, is chemically related to both, and is described by the company as an aminoplast.

Plaskon aminoplast is now in commercial use in a number of paper mills, and is going into paper draperies, diaper stock, Kraft bags, delicatessen and butcher papers, and toweling.

It is claimed to have a cost advantage over both urea and melamine wet-strengthening resins because it gives greater wet strength per unit weight resin used.

# For Light Color Alkyds!

## HARDESTY offers

HARDESTOIL 15			
	(73.4 - 78.8°F)	23.0 - 26.0°C.	
Titre	3	5	
Color—Gardner Standards 1933	minimum	125	
Iodine Value (Wijs)	98	100%	
Free Fatty Acid (as oleic)	195	199	
Acid Number	196	200	
Saponification Value			
HEAT STABILITY: After heating to			
235°C. for five hours with CO <sub>2</sub>	5	7	
Color—Gardner Standards 1933			
HARDESTOIL 16			
	(42.8 - 48.2°F)	6.0 - 9.0°C.	
Titre	3	5	
Color—Gardner Standards 1933	minimum	135	
Iodine Value (Wijs)	96	98%	
Free Fatty Acid (as oleic)	191	195	
Acid Number	192	196	
Saponification Value			
HEAT STABILITY: After heating to			
235°C. for five hours with CO <sub>2</sub>	5	7	
Color—Gardner Standards 1933			

## ALKYD RESIN GRADES of Soya Bean Fatty Acids

The light color of every drum of Hardestoil 15 and Hardestoil 16 proves their superior advantages in alkyd resins for protective coatings. Hardestoil 15 is specially formulated for use in production of rapid-drying, high gloss, durable primers, surfacers, outside and interior enamels, finishes and water emulsion paints. Hardestoil 15 and Hardestoil 16 bring new adhesive and weather-protective values to your coating, and offer increased protection economically. Where high iodine and low titre are requisites, specify Hardestoil 16.

### EACH LOT LABORATORY-TESTED

Because even precise controls do not always insure quality in alkyd manufacturing, W. C. Hardesty Company applies special laboratory tests to every lot of Hardestoil 15 and Hardestoil 16, to be sure clarity and color are consistently superior.

### YOU SAVE MONEY

Send for sample and learn how you can reduce your costs.

Available in 55 gallon special lined drums.



# W. C. Hardesty Company

41 EAST 42nd ST., NEW YORK 17

FACTORIES: DOVER, OHIO  
LOS ANGELES, CALIF. • TORONTO, CAN.

# NEW PRODUCTS & PROCESSES

## Phenolic Molding Compounds

New Hycar-phenolics are filled with asbestos, cotton flock, and fabric.

Three new Hycar-phenolic molding compounds have recently been developed by General Electric Co.'s Chemical Department. Supplementing the company's earlier wood flour-filled Hycar-phenolic compounds, the new compounds consist of an asbestos-filled, a cotton flock-filled, and a fabric-filled compound. Each of these compounds has unusual shock, vibration, and fatigue resistance, plus the characteristics of the filler material. The internal resiliency of these new compounds is derived from their Hycar American rubber component, a product of B. F. Goodrich Chemical Co.

These new powders extend the range of impact resistance for thermosetting molding compounds, permitting their use in applications formerly considered impossible for plastics materials, it is reported. Drop-ball tests indicate that these Hycar-phenolic compounds have shock resistance five to ten times as great as equivalent conventional phenolic molding powders. These tests also indicate that parts molded from these compounds will withstand severe mechanical abuse after cracking before complete failure occurs.

## Aluminum Stearate

Mallinckrodt offers new aluminum stearate of high gelling efficiency.

The Mallinckrodt Chemical Works, St. Louis, Mo., has added technical aluminum stearate, D-50, to its line of metallic soaps. Developed primarily for use in the lubricating grease industry, this new aluminum stearate offers the maximum in efficiency and gel stability. Soap costs may be reduced as much as 50% through the use of D-50 and therefore this new grade should be of interest to all industries using aluminum stearates as gelling agents.

Laboratory and field trials with a variety of oils and operating conditions have shown that D-50 greases, even at low soap concentrations, possess good resistance to mechanical breakdown upon working and have high dropping points, even texture, and superior resistance to bleed.

## Guncotton Process

Sulfuric acid traces neutralized by ammonia in new nitration technique.

A new method of stabilizing guncotton, which saves about two-thirds of the time formerly needed for making this important explosive, has been developed by the

Southern Regional Research Laboratory, U. S. Department of Agriculture. It makes possible a substantial cut in the cost of smokeless powder.

Guncotton, or nitrocellulose, is made by treating cotton linters with a mixture of nitric and sulfuric acids. The nitric acid combines chemically with the cellulose, but the sulfuric acid, which acts as a catalyst in the process, must later be washed and boiled out. Even small amounts of this acid left in the finished nitrocellulose



New process speeds guncotton manufacture.

make it likely to decompose. This instability may result in a gradual loss of the guncotton's explosive power or a change in its rate of power release. Under certain conditions, incompletely purified nitrocellulose may explode prematurely. Removing all traces of the sulfuric acid is difficult, and the conventional procedure for purifying and stabilizing the explosive is long, laborious, and expensive.

The new procedure requires much smaller operating space and less fuel than the conventional process. It removes most of the sulfuric acid by washing and boiling, as in the usual method, but in one-third to one-fourth the usual time: 20 hours instead of the customary 60 to 80 hours. All remaining traces of acid are then neutralized quickly with ammonia, a procedure which makes further boiling of the guncotton unnecessary. This final step of the new process may be carried out either at ordinary or at elevated temperatures.

Smokeless powder made with nitrocellulose stabilized by the ammonia procedure has passed all preliminary tests and is now undergoing long-term storage trials.

## Higher Phenols

Cashew nut shell liquid, now generally available, contains high-molecular-weight phenols.

Irrington Varnish and Insulator Co., Irvington 11, N. J., is making available in unlimited quantities its hydrogenated cashew nut shell liquid, a low-melting, waxy solid consisting of a mixture of various meta-substituted phenols. It contains approximately 50 per cent 3-pentadecyl phenol, 5 per cent 5-pentadecyl resorcinol, and 35 per cent phenols of higher molecular weight.

## Chromatogram Aid

Indicator is used in the chromatographic separation of organic acids.

Herstein Laboratories, Inc., 128 Water St., New York 5, N. Y., has available Alphamine Red R, an indicator used in the chromatographic separation of organic acids. It is applicable for mono and dicarboxylic acids, and amino acids. This is the first of a series of aids for chromatography which Herstein Laboratories, Inc., is planning to offer.

Suggestions for items to be included in the list are solicited.

## Caustic Descaling

Hooker makes new descaling process generally available to metal-working industry.

Hooker Electrochemical Co., Niagara Falls, N. Y., has made generally available to the metals' working industries a patented descaling process and Virgo Salt, the product used therein (*CI, August, 1949, p. 194*). They have been used in a relatively small number of commercial installations during the developmental stage. The new process, resulting from developments starting in 1937 and introduced on a small scale in 1944, has approximately 40 units operating in 31 plants. Over 20 different individual applications of the process are in use at the present time but current experimental work indicates that even more applications are possible. With this background of successful operations, Hooker feels that it is now possible to offer the process more widely to the industry.

## Anti-Corrosion Process

Patented method of bonding aluminum to steel gives promise of wide usage.

A new aluminum-on-steel combination that gives promise of wide usage to protect steel against corrosion has been patented by Reynolds Metals Co., Richmond, Va.

In the new method, two strips of aluminum foil are applied to top and bottom of the steel sheet. A fine iron coating is applied to the steel first by an electrolytic process to provide a permanent bond between the steel and aluminum surfaces.

**DO IT  
NOW!**



Check **COLUMBIA'S** facilities  
for supplying

**PARA-DICHLOROBENZENE**

all standard sizes and  
25, 50, 100 and 200 lb. steel drums

**ORTHO-DICHLOROBENZENE**

55 gallon drums 1,000 gallon tank cars

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These chlorinated benzenes are available for immediate shipment in any quantity, including special size work order quantities. You can find many desirable advantages for your business by using Columbia facilities—or better, why not checking this is out... contact our nearest district representative Pittsburgh Plate Glass Co., Columbia Chemical Division, 1000 W. 10th Street, Pittsburgh 15, Pa.

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**CHEMICALS**

PAINTS - GLASS - PLASTICS - RUBBERS

**PITTSBURGH PLATE GLASS COMPANY**

## WE'VE DONE IT FOR DRY CLEANERS . . .

. . . for those who dry clean your clothes, renovate your draperies or scour and mothproof your rugs. Seldom, today, are these things returned from the better cleaning establishments, reeking, as formerly, of the solvents, naphthas and various kerosene derivatives used in dry cleaning formulas. The simple explanation for this is that inexpensive, yet effective, deodorizing compounds have been developed to overcome the obnoxious odors of these constituents. Now, when your properly treated garment, rug or slip-cover is returned to you, it should not only look clean . . . it should *smell* clean!

## PERHAPS WE CAN DO IT FOR YOU! . . .

Our technical staff has made important contributions to the variety and efficiency of the odor neutralizing materials now available for the cleaning industry. It has developed equally efficient deodorants for other fields—plastic, textile, rubber, oil, paint, glue, to mention but a few. It is prepared, further, to work on *your* industrial odor problem if you have one, whether it involve the creation of a selling fragrance for your finished product or the development of an odorant designed merely to “cover” an objectionable processing odor in your plant or a bad residual odor in your product. Just tell us what your problem is and we'll gladly work with you toward a practical and economical solution.

**FRITZSCHE**  
*Brothers, Inc.*



PORT AUTHORITY BUILDING, 76 NINTH AVENUE, NEW YORK 11, N. Y.

BRANCH OFFICES and STOCKS: Atlanta, Ga.; Boston, Mass.; Chicago, Ill.; Cincinnati, O.; Cleveland, O.; Dallas, Tex.; Detroit, Mich.; Los Angeles, Calif.; Philadelphia, Pa.; San Francisco, Calif.; St. Louis, Mo.; Toronto, Canada and Mexico, D. F.  
FACTORY: Clifton, N. J.

Older methods of applying aluminum to steel by dipping the steel in molten aluminum obtained an unsatisfactory bond.

The mill setup for handling the application of this coating involves passing steel strip in a single continuous process from a coil through a cleansing bath, an electrolytic bath where it receives the iron coating, a furnace to heat it to about 850°F, then between two strips of aluminum foil which are bonded to the steel by high pressure rolling. The aluminum-covered steel can then be further rolled to reduce its thickness as desired.

### Carbohydrate Reagent

**Anthrone is useful for qualitative and quantitative carbohydrate analysis.**

Anthrone, 9,10-dihydro-9-ketoanthracene, is now available from Jasons Drug Co., 1085 Myrtle Ave., Brooklyn, N. Y. It is a pale yellow powder with a melting point of 153-5°C. This reagent is useful for determining mono and polysaccharides and their esters. It is also used for determining the presence of gums, glucosides, starches and complex sugars with organic groups such as glycolipids and nucleic acids. For the quantitative determination of carbohydrates the color produced with anthrone is measured with an instrument that determines the intensity of color produced, such as the spectrophotometer. To date few substances have been found to interfere with this reagent.

### Fertilizer Process

**Granulation process simplifies manufacture and storage of fertilizers.**

Sturtevant Mill Company, 100 Park St., Boston 22, Mass., has developed a granulation process for manufacturing granular or pelletized fertilizer. This method produces fertilizer granules of uniform size. Its design and construction assure long operating life with little, if any, maintenance.

Granular fertilizer offers many advantages over the present type of fertilizer. It can be stored over long periods of time without caking. Thus it can be bought at any time and used when necessary, enabling the manufacturer to prepare in advance as much fertilizer as the anticipated market demands. It also means that the fertilizer manufacturer can spread out his manufacturing over longer periods.

### Gold Recovery

**Precipitation process recovers gold from waste waters in fabricating plants.**

In cooperation with the Merrill Company of San Francisco, Calif., Sam Tour & Co., Inc., 44 Trinity Place, New York, N. Y., has adapted the patented Merrill-Crowe precipitation process for the treatment of waste waters in plants using gold. In this continuous automatic process, the waste waters are pretreated, clarified, de-

# Bring on chemicals with TEETH!

**"KARBATE"**  
Impervious Graphite  
Heat Exchangers  
**ARE READY!**

"Karbate" Impervious Graphite Heat Exchangers handle an extremely wide range of corrosive fluids. They are both acid-resistant and alkali-resistant. Their thermal conductivity is higher than that of most commonly used metals. They are light in weight, immune to thermal shock, will not contaminate the solution, and are amply strong and vibration resistant. "Karbate" heat-exchanger types include: tube-bundle, cascade, plate, bayonet, and concentric in standard and special sizes.

Other "Karbate" equipment includes: pipes and fittings, valves, pumps, tanks. For more details write to National Carbon Company, Inc., Dept. CI.

*The term "Karbate" is a registered trade-mark of*  
**NATIONAL CARBON COMPANY, INC.**  
*Unit of Union Carbide and Carbon Corporation*  
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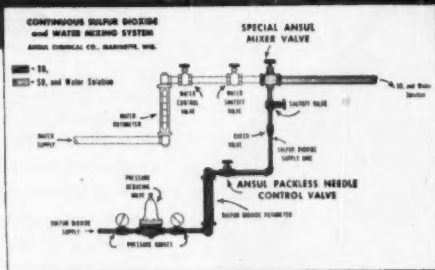
*Division Sales Offices:* Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

**Foreign Department: New York, U.S.A.**  
*These products sold in Canada by Canadian National Carbon Co. Ltd., Toronto 4.*

"Karbate" Impervious Graphite tube-bundle heat exchanger, floating-end diaphragm construction, used for partial concentration of  $H_2SO_4$  contaminated with volatile organics. Contains 233 tubes,  $\frac{7}{8}$  in. dia. by 9 feet long. Tube sheets are  $2\frac{3}{4}$  in. dia. by  $6\frac{1}{4}$  in. thick.

WITH AN **ANSUL**  
**CONSTANT SO<sub>2</sub> CONCENTRATION**  
**SYSTEM**

**Safer to handle and operate**



**ANSUL CHEMICAL COMPANY**  
INDUSTRIAL CHEMICALS DIVISION, MARINETTE, WISCONSIN  
60 E. 42nd St., New York—Lincoln-Liberty Bldg., Broad & Chestnut Sts., Philadelphia 7, Pa.

• **2,3,5-Triphenyl tetrazolium chloride**, an important reagent chemical for biochemical research, is now available in crystalline form from Schwarz Laboratories, Inc., 202 East 44th Street, New York 17, N. Y. When TPTZ is used as an indicator for reducing substances it is converted to a red compound. Similar to Fehling's reagent in reactivity and selectivity, TPTZ is a better indicator for the start of the reaction and requires no heat. Other equally important uses for this reagent are as a classifying test for reducing power in organic or biochemical characterizations, and in a rapid method

# How important is **CARBON DISULFIDE** (Bisulfide) to your operation?

***Baker, pioneers of the electro-thermic method, assures you CS<sub>2</sub> of highest purity and uniformity—at low cost.***

## **SPECIFICATIONS FOR BAKER'S CARBON DISULFIDE TECH.**

### **CS<sub>2</sub>**

Assay (CS <sub>2</sub> )	99.99%
Boiling Point Range	45°—47° C.
Specific Gravity at 15.5° C.	1.273±0.002
Non-volatile Matter	0.003% Max.
Sulfite	Nil
Sulfate	Nil
Foreign Sulfides	Will not discolor Lead Acetate solution

### **STANDARD SINGLE TRIP CONTAINERS**

55 gallon, 10 gallon, 5 gallon drums and  
Tank Cars (8,000 gallons)—approximately  
85,000 pounds.

If you manufacture rayon, rubber products, rubber intermediates, matches, varnishes, insecticides—or any one of a wide variety of other products—Carbon Disulfide means a great deal to your particular process, especially if you can obtain constant uniformity and purity at low cost.

To assure you of all three of these essential qualities, Baker produces Carbon Disulfide by the unique electro-thermic method, a process invented by Taylor and improved and perfected by Baker.

This precision method... coupled with continuous rather than batch distillation... insures uniformity of the finished product. You will find Baker's Carbon Disulfide exceptionally free from other sulfide impurities! It assays 99.99%!

No matter what product you manufacture—if it requires a superior Carbon Disulfide of measured purity and uniformity at low cost—it will pay you to specify Baker.

Baker is one of the principal volume producers of Carbon Disulfide. Our production is continuous... our sales are made in Tank Car Lots or Carloads in Drums to many of the large users. If you require Carbon Disulfide for your process work, Baker solicits your business.

Address J. T. Baker Chemical Co., *Executive Offices*, Phillipsburg, N. J.



C. P. ANALYZED • FINE • INDUSTRIAL

# FURFURAL FACTS, NO. 1 OF A SERIES



## Furfural Facts For Management

One of these days you are likely to be asked to O.K. a project involving furfural use research or an actual commercial application. This chemical is steadily expanding into new fields and many concerns have already found that a study of furfural use is profitable. Here are facts about furfural to help you evaluate what it offers you.

**1. TECHNICAL SUCCESS**—Furfural is a multi-purpose product. It is a reactive solvent for resins in making brake linings and abrasive wheels; a selective solvent for refining rosin, petroleum, vegetable oils, and C-4 hydrocarbons; the chemical building block for a host of useful chemicals including nylon intermediates and phenolic resins.

**2. AVAILABILITY AND SUPPLY**—Plentiful quantities of furfural are available on a year around basis. Furfural is made from non-food raw materials such as corn cobs, the supply of which is readily renewable and far in excess of any foreseeable demand. Furfural manufacturing plants are located at Cedar Rapids, Iowa and Memphis, Tennessee.

**3. ECONOMY**—Furfural is inexpensive and has been for a long time. For twenty years it has sold for less than ten cents per pound in tank car lots. There has been no price increase in over five years.

**4. SAFETY**—Over twenty-five years of commercial experience with furfural in industry has demonstrated that it can be handled safely without endangering the health of those working with it.

**5. EASE OF HANDLING**—The freezing point of -33°F. is so low that furfural can be stored safely and can be used at low temperatures without requiring special handling precautions in cold weather.



**Suggestion**—If you would like to know more about furfural itself and the uses which have been developed, we suggest that you ask us for copies of Bulletins 201 and 204.



**The Quaker Oats Company**

1920A BOARD OF TRADE BLDG.  
141 W. JACKSON BLVD., CHICAGO 4, ILL.  
NEW YORK, 1232A WHITEHALL BLDG., N.Y. 4, N.Y.

In San Francisco, The Griffin Chemical Company • In the United Kingdom, Imperial Chemical Industries Ltd., Billingham, England • In Australia, Swift & Company, Pty. Ltd., Sydney • In Europe, Quaker Oats-Green-production N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8E, France

**CHEMICALS DEPT.**

for testing the germinating capacity of seeds. More recent work with TPTZ has shown it to be useful in the separation of dead from living bacteria and yeast cells, and in the production of penicillin, as well as in other important applications. Ample stocks are available.

• Natural rubber greatly improves the durability of leather in a new treating process developed at the National Bureau of Standards. Through the impregnation of leather with natural rubber, Bureau scientists have been able to increase the abrasion and water resistance so that sub-standard leather — such as “belly-cuts” from steer hides—may be used commercially. Preliminary results from service tests of rubber-treated soles indicate a definite improvement in wearing qualities over untreated leather soles. Earlier work at the Bureau explored the use of synthetic resins in the treatment of leather, and investigations are now under way on the use of synthetic rubber and other materials.

• Ten interesting fluorogamics are now available in research quantities from Halogen Chemicals, Inc., Columbia, S. C.:  $\text{CH}_3\text{CF}_2\text{CH}_2\text{Cl}$ , b.p. 55.2°C.;  $\text{CF}_2\text{Cl}-\text{CCl}_2\text{CF}_3$ , b.p. 72°C.;  $\text{CF}_3\text{COONa}$ , white powder;  $\text{CH}_3\text{CFClCH}_2\text{Cl}$ , b.p. 88.5°C.;  $\text{CH}_2\text{ClCF}_2\text{Cl}$ , b.p. 46.8°C.;  $\text{CFCl}_2\text{CCl}_2-\text{CFCl}_2$  b.p. 194.2°C.;  $\text{C}_7\text{F}_{14}$  (perfluoromethylcyclohexane), b.p. 76°C.;  $\text{CHCl}_2-\text{CHF}_2$ , b.p. 60°C.;  $\text{CHCl}_2\text{CFCl}_2$ , b.p. 116.6°C.;  $\text{CF}_2\text{ClCFClCF}_2\text{Cl}$ , b.p. 73.7°C. These organic fluorides or their derivatives may be useful as lubricants, fire extinguishers, solvents, anesthetics, heat transfer agents, refrigerants, insecticides, dyes, medicines, plastics, dielectric fluids, pharmaceuticals and hydraulic fluids.

• Tennessee Eastman Corp., Kingsport, Tenn., offers commercially a straight, direct acetate brown, Eastone Brown 2R. This dyestuff dyes acetate fibers a reddish brown and nylon a slightly duller shade. Unique shade and fastness properties attributed to Eastone Brown 2R are said to make it a valuable color for shading and for producing deep tertiary shades on a variety of fabrics which must meet certain fastness requirements. It is highly recommended by the manufacturer as the base color, in conjunction with the gas-resistant azo blues, in formulating lining shades.

• Permanent Pigment Blue (green shade phthalocyanine blue) has been added to the line of flushed colors offered printing ink manufacturers by the Hilton-Davis Chemical Co. Division, Sterling Drug, Inc., Langdon Farm Road, Cincinnati, O.

• Chemo Puro Manufacturing Co., Inc., 26-32 Skillman Avenue, Long Island City;

## RESINS

COUMARONE-INDENE  
MODIFIED COUMARONE  
INDENE  
ALKYLATED PHENOL  
OXIDIZING  
RESIN SOLUTIONS

## COAL-TAR SOLVENTS

BENZOL  
TOLUOL  
XYLOL  
HI-FLASH SOLVENT  
COSOLS  
52-N-1

## PLASTICIZING OILS

## CREOSOTE OILS

## SHINGLE STAIN OILS

## NEUTRAL OILS

## TAR ACID OILS

## PHENOTHIAZINE

## TAR PAINTS

# NEVILLE

# *Chemicals*

**For The Nation's Vital Industries ★**



*Ask for new  
Price List*

This new price list also gives description and characteristics of Neville quality products, designed to serve various industrial needs.

## THE NEVILLE COMPANY

PITTSBURGH 25, PA.

A-34



# Newark METALLIC FILTER CLOTH

*Combines Accuracy  
with Durability*

For many years, processing engineers who demand the best in Metallic Filter Cloth have specified NEWARK. This cloth offers a combination of accuracy and durability—a superior cloth with a long service life.

Newark Metallic Filter Cloth is available in a wide variety of metals and in plain, twill, plain dutch, double twill dutch, and other weaves. Our wide experience in the processing field is your assurance of the right cloth for your filtration problem.

Samples are available.

**NEWARK**  
*for* **ACCURACY**

# Newark Wire Cloth

**COMPANY**

345 VERONA AVENUE

NEWARK 4, NEW JERSEY

is producing a new form of choline salt, *choline dihydrogen citrate*. The new salt can be used for tabletizing. Chemo Puro also produces it in two other forms: regular for liquids and fines for capsules

- *Intestinal phosphatase*, technical, offered by Armour and Co., Chemical Research and Development Department, Chicago 9, Ill., has proved useful in the liberation of bound pantothenic acid. Intestinal phosphatase, technical, now provides a valuable tool in the estimation of this vitamin. Intestinal phosphatase, technical, a phosphorus-splitting enzyme of the alkaline type, contains less than 5% moisture, less than 5% ash, and 15 units of activity per milligram.

*Hyaluronidase*, a mucolytic enzyme, is also available. It depolymerizes highly polymerized mucopolysaccharides such as hyaluronic acid, which consist of acetyl glucosamine and glucuronic acid. Hyaluronidase is a valuable new research tool in the study of inflammation reactions. Armour Hyaluronidase contains less than 12% moisture, over 200 turbidity reducing units per milligram.

- Halogen Chemicals, Inc., 616 King St., Columbia 52, S. C., is offering various organic *fluorides* in research quantities for investigation as possible fluoroplastic intermediates.

Formula	B.P., °C.
$\text{CH}_2\text{CF}_2\text{CHCl}$	43 & 60
$\text{CHCl:CClCF}_2$	53.7
$\text{CCl:CClCF}_2\text{CF}_2$	90.7
$\text{CCl}_2\text{CFCF}_2$	46.4
$\text{CH}_2\text{CF}_2\text{CCl}_2$	79
$\text{CFCl:CClCF}_2$	47.3
$\text{CHCl:CFCl}$	35.1
$\text{CCl}_2\text{CFCl}$	71
$\text{CCl}_2\text{CClCF}_2$	114.4
$\text{CHCl:CClCF}_2$	89

These materials each contain a double bond and one or more fluorine atoms. They have extremely interesting potentialities for the preparation of stable fluorine-containing polymers and plastics.

- The following *research chemicals* have been added to the list of Sapon Laboratories, Inc., 543 Union St., Brooklyn, N. Y.: Azelaonitrile, sebaconitrile, ethyl  $\beta$ -chloroisobutyrate, ethyl  $\beta$ -chlorobutyrate, ethyl  $\beta$ -bromobutyrate, ethyl  $\beta$ -bromoisobutyrate, ethyl  $\beta$ -bromovalerate, ethyl  $\beta$ -bromoisovalerate, ethyl  $\beta$ -bromocaproate.

- Heyden Chemical Corp., New York 1, N. Y., has added four new intermediates for the scientific and industrial field: *benzoic acid* and *p-benzylphenol*, which are now commercially available, and *benzil* and *benzoil*, which can be obtained in pilot plant quantities. Technical bulletins and samples are available to interested organizations.

The first group of four, offered recently, included *anisic acid*, *anisoyl chloride*, *o-chlorocinnamic acid*, and *4,4'-dichlorobenzophenone*.

**DOUBLE CHECKED  from RESEARCH to INDUSTRY**

# Sharples ETHYLAMINES

**MONOETHYLAMINE  
DIETHYLAMINE  
TRIETHYLAMINE**

## Present and Suggested Uses:

### MONOETHYLAMINE

- Petroleum**—Solvent extraction; preparation of amides useful in refining of lubricating oil; complex salt with CuCl useful for recovery of diolefins; intermediate for preparation of demulsifier.
- Solvent**—Selective solvent in petroleum and vegetable oil refining; solvent for wide range of organic compounds.
- Textiles**—Intermediate for synthesis of surface active agents, dyestuffs and sizing compounds.
- Emulsions**—Fatty acid soaps as emulsifying agents for self-polishing waxes.
- Rubber**—Synthesis of vulcanization accelerators; stabilizer for latex.
- Plastics**—Condensing agent for urea-formaldehyde molding mixtures; preparation of various nitrogen ethylated amides which are useful as plasticizers; condensation products with other resin forming materials useful as moldings, coatings, adhesives and sizing compounds.
- Ceramics**—Deflocculating agent for increasing strength of clay bodies.
- Pharmaceuticals**—Synthesis of medicinals.
- Photography**—Synthesis of photographic dyes.
- Agriculture**—Solubilizing agent for 2,4-D acid.
- Paper**—Intermediate for plasticizing and flame-proofing agent.

### TRIETHYLAMINE

- Petroleum**—Agent for improving recovery of catalyst in fluid cracking operations.
- Solvent**—Catalytic solvent in chemical synthesis; solvent for many organic compounds; stabilizer for certain chlorinated hydrocarbons.
- Textiles**—Preparation of wetting, penetrating and waterproofing agents of quaternary ammonium types.
- Enamels**—Anti-livering agent.
- Rubber**—Preparation of accelerator activators for natural and synthetic rubbers.
- Cosmetics**—Preparation of emulsifying agents and germicides.
- Agriculture**—Solubilizing agent for 2,4-D acid.

### DIETHYLAMINE

- Petroleum**—Solvent extraction; preparation of amides useful in refining of lubricating oil; complex salt with CuCl useful for recovery of diolefins; intermediate for preparation of gasoline stabilizer.
- Solvent**—Selective solvent in petroleum and vegetable oil refining; solvent for wide range of organic compounds.
- Textiles**—Intermediate for synthesis of surface active agents, dyestuffs and sizing compounds.
- Rubber**—Intermediate for synthesis of a number of ultra-accelerators of vulcanization and accelerator activators for natural and synthetic rubbers.
- Plastics**—Condensation with other resin forming materials to give products useful for moldings, coatings, plasticizers and polishes.
- Pharmaceuticals**—Intermediate for synthesis of certain local anesthetics, antimalarials, antiseptics and other medicinal chemicals.
- Cosmetics**—Intermediate for synthesis of emulsifiers.

**OTHER SHARPLES AMINES:** Mono-, Di-, Tributylamines  
Mono-, Diisopropylamines  
Diethylaminoethanol  
Dimethylaminoethanol  
Ethyl ethanolamines 161

*Samples and prices on these commercial amines are available from Dept. A.*

## SHARPLES CHEMICALS INC.

NEW YORK  
PHILADELPHIA  
CHICAGO



For Your  
Information



## New Maleic Anhydride Briquettes Are Easier to Use...Safer to Use

If dust from maleic anhydride has been bothersome in your plant, or if you've found it troublesome to break up maleic anhydride that has solidified, you'll call Monsanto's newly-developed briquettes *good news*.

Monsanto's maleic anhydride briquettes are available now in commercial quantities... and at no increase in price over flake or fused forms. Compared with the product fused or in flakes, the new briquettes work to your advantage for the following reasons:

1. They're **SAFER**...free of dust.
2. They're **EASIER** to weigh and handle.

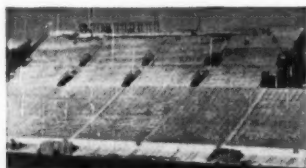
3. They're **EFFICIENT** in application because they are uniform in size and shape.

4. They're **LOW IN MOISTURE PICKUP**...less hydrolysis.

With these advantages... and with the price identical with that of other forms... the new briquettes already are finding wide acceptance among companies regularly using maleic anhydride.

For complete customer service, Monsanto is continuing to make maleic anhydride in flake and fused forms.

If you would like more information, quotations and a sample of Monsanto Maleic Anhydride Briquettes, fill in and mail the coupon. Or, if you prefer, get in touch with the nearest Monsanto Sales Office.



## Penta Protects Seats in Missouri U. Stadium

Seats in Memorial Stadium at the University of Missouri take a terrific beating from sun, rain, snow, sleet... and enthusiasm. So... when 5,000 seats were added to the stadium last season... officials decided to put long life into the wood. How? By using lumber treated with a water-repellent solution of Monsanto PENTACHLOROPHENOL... to protect against fungi, wood-boring insects and weather. Penta, properly formulated and applied, gives a clean, dry treatment, free from objectionable chemical odor. The surface is paintable.

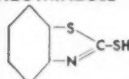


## Research Chemists' Corner

Chemists with creative imagination may see possibilities for new or improved products in Monsanto 2-Mercaptobenzothiazole. Look over the data on this chemical given below, and, if you are inspired to research, mail the coupon for a free sample.

### 2-MERCAPTOBENZOTHAZOLE

#### Structure:



#### Appearance:

Light yellow powder

#### Specific gravity:

1.42 @ 25° C.

#### Moisture:

Not more than 1%

#### Ash:

Not more than 0.5%

#### Solubility:

Soluble in acetone, alcohol, benzene, chloroform and dilute caustic.

Two grades available, one assaying at least 97%, melting point at least 175° C.,

## New Santolene C, in Gasoline and Oil, Stops Rust

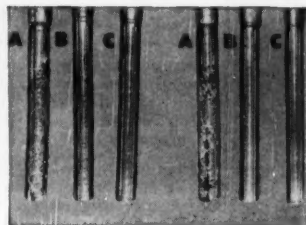


Illustration shows how Santolene, added to gasoline, stops rust. (A) Result with no Santolene C. (B) 10 ppm. Santolene. (C) 20 ppm. Santolene.

Santolene\* C... developed through Monsanto Research... has solved the rust problem in transportation and storage of light petroleum products. Laboratory tests give evidence of the effectiveness of Santolene C. Pipe-line tests, now under way, are promising.

Santolene C is effective when used in small concentrations, hence it offers an economical way to end the rust problem. A 42-gallon barrel of gasoline or light oil can be inhibited for about 0.14 cents. At concentrations up to .01% Santolene has no noticeable effect on the usual specification items in gasoline, kerosene or No. 2 fuel oil. If you'd like to put Santolene C through the paces in your own laboratory, mail the coupon for a free sample.

and another assaying at least 94%, melting point at least 170° C.

### Reactions

Oxidation: Using peroxide, chlorine, persulfate or hypochlorite gives 2,2'-dithio-benzothiazole. Under strongly alkaline conditions the sulfonate is formed which on acidification yields 2-hydroxy benzothiazole.

Organic salts are formed by reaction with strong organic bases. Alkali metal salts are formed by reacting in aqueous medium. Heavy metal salts are formed by double decomposition of the alkali metal salts and soluble salts of heavy metals. Formaldehyde forms 2(hydroxy methyl mercapto)benzothiazole. Alkyl halides react to form alkyl thio ethers. Aryl halides react to form thiol esters.

## Improved HB-40 Permits Bright Colors in Vinyls at Low Cost

Monsanto has improved HB-40 (partially hydrogenated terphenyl), making it practically water-white. Properly stabilized clear and tinted vinyl plastics, using HB-40 as an extender plasticizer, have good light stability.

HB-40 is an excellent low-cost plasticizer for polystyrene dispersions and casting resins.

In vinyls, HB-40 is used as an extender for primary plasticizers, from 25% to 50% on the total weight of the plasticizer being used in many formulations. HB-40 is attractively low in price, making for economical production. It is extremely low in toxicity . . . strong in moisture resistance . . . has excellent electrical characteristics and is non-migratory, giving a dry "hand" and increased tensile strength. HB-40 is used in vinyl extrusions; injection moldings; coatings for fabrics, metals and



Vinyl film in which HB-40 served as an extender for the primary plasticizer

other materials; and in unsupported films. HB-40 is especially attractive for use in vinyl organosols and plastisols. It does not increase the viscosity of the pastes.

If you are interested in cutting costs, without sacrificing quality in your plastics, have a look at HB-40. Technical data, quotations and samples will be sent promptly upon request. The coupon is for your convenience.

## AROCLORS Put Extra Qualities in Paints for Maintenance Jobs

If you manufacture maintenance paints, you undoubtedly will be interested in AROCLORS (chlorinated biphenyl and chlorinated polyphenyls). They are used, as plasticizers or resins, by most leading makers of modified and synthetic rubber protective coatings for concrete, metal or wood.

The AROCLORS add qualities to protective coatings that mean protection. They give greater toughness and adhesion . . . stronger resistance to corrosion, flame, water and weather . . . greater resistance to acids and alkalis. They have good electrical insulating properties.

Manufacturers of protective coatings have a choice from a series of AROCLORS . . . both liquids and resins . . . having a wide variety of properties. If you are a user of paints, it will pay you to specify maintenance paints that contain AROCLOR.\*

## Santophen 1 Tested in Germicidal Soap

Santophen\* 1, introduced last year for use in disinfectants, has now found a new application—in coconut oil germicidal soap

formulations. In tests, Santophen 1 retained its germ-killing power even when the soap-to-germicide ratio ran as high as 20 to 1. These tests indicate the usefulness of Santophen 1 in floor cleaners, rug shampoos, surgical soaps and industrial cleaners. (Word of caution: If you're thinking of using Santophen 1 in surgical soaps, you should test your formulation for irritation or dermatitis.) Further information and a sample of Santophen 1 will be sent to qualified persons upon request. Use the handy coupon.

## If You Must Dehair a Hog, Santomerse No. 1 Will Help

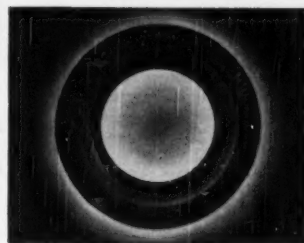
The task of scalding and dehairing hogs is made easier by the use of Santomerse\* No. 1, a Monsanto Detergent and Wetting Agent.

Santomerse No. 1 lowers the surface tension of water . . . makes it wetter. It therefore penetrates the hog bristles and makes them easier to remove.

The detergent also helps to hold grease, waste, fat and blood particles in suspension so that they are not redeposited on the sides of the scalding vat.

The Santomerse No. 1 is added before the water is heated, at the rate of one cup of Santomerse No. 1 to 50 gallons of water.

## Methylene bis (paraphenylene isocyanate) Helps Make Rubber Stick to Fibers



New developments often bring new problems. That's what happened when synthetic fibers entered into the manufacturing processes of rubber products. Cotton had been used before.

The adhesives used to make rubber adhere to cotton would not work with the synthetics. Now, that difficulty has been overcome. Monsanto's Methylene bis (paraphenylene isocyanate) makes an adhesive that insures a lasting bond between rubber and synthetic fibers.

If you have need to bond rubber and synthetics . . . or if this application of Methylene bis (paraphenylene isocyanate) suggests other uses . . . get in touch with Monsanto. Sample and technical information will be sent upon request.

\*Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY,  
Desk A, 1703 South Second Street, St. Louis 4,  
District Sales Offices: Birmingham, Boston,  
Charlotte, Chicago, Cincinnati, Cleveland,  
Detroit, Los Angeles, New York, Philadelphia,  
Portland, Ore., San Francisco, Seattle. In Canada,  
Monsanto (Canada) Ltd., Montreal.



SERVING INDUSTRY...WHICH SERVES MANKIND

Maleic Anhydride Briquettes: ☐ Data,  
☐ Sample. 2-Mercaptobenzothiazole:  
☐ Data, ☐ Sample. Santophen 1:  
☐ Data, ☐ Sample. Santolene C:  
☐ Data, ☐ Sample. Penta: ☐ Data,  
☐ Sample. For use in \_\_\_\_\_  
HB-40: ☐ Data, ☐ Sample. For use  
in \_\_\_\_\_  
AROCLORS: ☐ Data, ☐ Sample. For  
use in \_\_\_\_\_

MONSANTO CHEMICAL COMPANY  
Desk A, 1703 South Second Street  
St. Louis 4, Missouri

Please send, without cost or obligation, information and samples as indicated at the left.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

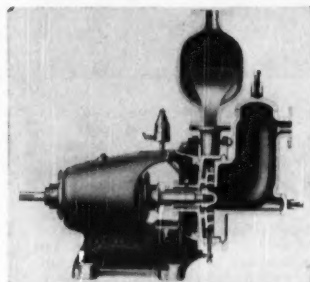
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# NEW EQUIPMENT

## Self-Priming Pump

New design corrosion resisting self-priming Durcopump cuts priming time 66%.

The Model 40 Series R self-priming Durcopump of Duriron Co., Dayton 1, O., in plant tests conducted in accordance with Hydraulic Institute standards will prime in 22 seconds with a static lift of 15'. After being primed, it maintains dry vacuum as high as 28.4" Hg. The air



handling capacity of the new pump is greater than that of any self priming pump on which comparative tests were made.

This new pump is now available in two sizes, one with capacity ranging from 20 GPM against 81 ft. TDH to 160 GPM against 33 ft. TDH and the other with capacity ranging from 40 GPM against 125 ft. TDH to 240 GPM against 75 ft. TDH, when operating at 1750 RPM. Larger pumps are expected to be available later.

## Handwheel Valve

Bypass installation eliminated by new handwheel.

The new continuously connected handwheel control valve of Hammel-Dahl Co., 243 Richmond St., Providence 3, R. I., eliminates the necessity of the conventional bypass installation. The new handwheel is powerful enough to operate the control valve manually, regardless of maximum instrument air pressure on the diaphragm, or in opposition to the spring. It is therefore possible to position the valve plug by hand under any conditions, by merely turning the handwheel to the required position.

In valve sizes 2" and larger the elimination of bypasses, with the consequent saving in block valves, pipe fittings, other material, and installation labor, will more than pay for the handwheel.

Travel limit stops are incorporated in this design and can be set to limit the valve stroke from 0 to 100%. This valve travel can be located at any point in the

valve stroke from fully closed to fully open. With this arrangement, when the valve is on automatic control, the handwheel is adjusted so that the valve can operate freely about the average plug position.

The handwheel may be applied to any Hammel-Dahl valve, size 1 1/4" through 16".

## Gas Purifier

Baker & Co. introduces three new Deoxo gas purifiers

Newly developed Engelhard catalysts have resulted in the introduction of three expanded Deoxo processes for the catalytic purification of gases by Baker and Co., Inc., E. Newark, N. J.

Model M Deoxo purifier provides for the catalytic combination of oxygen and carbon monoxide to form carbon dioxide in the absence of hydrogen. Gas temperatures must be maintained above 100° C. for complete reaction.

It may also be used for the catalytic oxidation of carbon monoxide to carbon dioxide in a hydrogen-rich atmosphere, if gas is maintained between 120° C. and 160° C. Further, the Model M purifier may be used for the catalytic oxidation of hydrogen in oxygen gas. Temperature must be 120° C. or higher.

Second is Model DM Deoxo purifier, providing a simultaneous catalytic combination of oxygen with carbon monoxide and hydrogen to form carbon dioxide and water. Temperature is maintained between 120° C. and 500° C.

Methane and water vapor are formed from the catalytic combination of carbon monoxide and hydrogen, using Model E Deoxo purifier. For a complete reaction, gas must be maintained above 200° C.

The new Deoxo purifiers range from 200 cfm to 100,000 cfm.

## Gas Flow Meter

Fischer & Porter Co. develops new variable area gas flow meter.

A new variable-area gas flowmeter known as the "Floguide" has been developed by the Fischer & Porter Co., County Line Road, Hatboro, Pa. The tapered precision-bore metering tube and the "float" are fabricated from stainless steel. The metering tube is brazed to the cast iron inlet and outlet fittings, permitting simple and attractive panel installations. The extension below the metering tube carries an accurate metering scale, and an indicator below the float permits direct reading of flow rate. The wide-angle scale can be read from within a 180° arc and is also rotatable for complete flexibility of installation.

The Floguide is available in ca-

pacities ranging from 45 to 16,000 standard cubic feet of carbon dioxide per hour, 200 to 76,000 SCFH hydrogen, and comparable capacities for other gases. Although primarily designed for low pressure service, Floguide meters can be furnished to withstand 600 psig working pressure in all sizes. Maximum operating temperature is limited by the properties of commercially-available packings.

## Turbidity Detector

New electronic device detects suspended impurities in liquids.

A new electronic device, known as "Purifil," provides instant detection of turbidity in transparent liquids. The unit can actuate a warning device to indicate when suspended impurities exceed a limit or it can perform any on-off operation that can be initiated by a relay. It is produced by Electric Eye Equipment Co., Danville, Ill.

The detecting device depends upon the ratio of scattered light to transmitted light falling on a single phototube. Therefore the action is independent of the color of the solution and not affected by phototube aging or drift or variations in line voltage. Consequently, it does not have to be balanced or "zeroed."

The degree of cloudiness at which the instrument functions is adjusted by turning an index knob. At maximum sensitivity, the instrument will function at 5 ppm of bleaching earth suspended in oil, or



at 0.5 ppm of nickel catalyst suspended in hydrogenated fat.

The fluid to be controlled flows through the inspection chamber shown in the photograph at the left side. The detecting device is enclosed in the box at the right. The alarm and/or relay is mounted in any desired location. Pilot lights show whether the relay and distant alarm are on.

## New Line of Valves

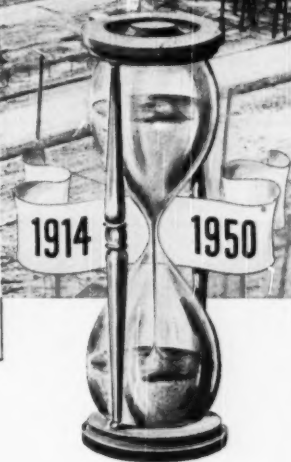
Thirty items in new 200-pound union bonnet bronze gate valve line.

A new line of 200-pound union bonnet bronze gate valves is being introduced by The Ohio Injector Co., Wadsworth, Ohio. The firm is expanding its bronze line to include thirty different items.

This new series carries a rated working pressure of 200 pounds steam at 550° F. —400 pounds water, oil and gas non-shock. These valves are of the union bonnet screwed end type and are available in the solid wedge rising stem, double-rising rising stem or solid wedge non-rising stem design, all having tapered seats and



At right is the Chemico field office at Muscle Shoals where nitrate was produced during World War I. Above is the Construction Administration Area of the Jayhawk Ordnance Works, a Chemico World War II project.



# "Experience

is the surest standard by which to test"

WASHINGTON

CERTAINLY George Washington's yardstick of experience can be used to evaluate a business organization. It's the "surest standard", in fact, when you entrust responsibility for the design and construction of a heavy chemical plant.

Chemico is long on this valuable experience. Its record of building profitable plants goes back to 1914. Chemico played a vital role in two world wars... aided the development and expansion of industry throughout the world in times of peace.

During the past 36 years, Chemico has pioneered in the development of new and improved processes for the recovery and

production of sulfuric acid and the production of nitric acid, synthetic ammonia and other heavy chemicals. Today, Chemico enjoys an international reputation in the field of chemical plant design.

This broad experience is the basic reason why Chemico-built plants deliver their full capacity year in and year out... why they operate at high efficiency with a minimum manpower requirement... why they have proved to be profitable investments.

If you are planning to build a heavy chemical plant or remodel an old one, entrust the project to Chemico—the firm with the widest and longest experience.

## Typical Chemico Undertakings

### PLANTS FOR PRODUCTION OF

SYNTHETIC AMMONIA  
SYNTHETIC METHANOL  
DOUBLE SUPERPHOSPHATE  
AMMONIUM PHOSPHATE  
AMMONIUM SULFATE  
AMMONIUM NITRATE  
CALCIUM NITRATE  
FORMALIN

### PLANTS FOR PRODUCTION, CONCENTRATION AND RECOVERY OF

HYDROCHLORIC ACID  
NITRIC ACID  
PHOSPHORIC ACID  
SULFURIC ACID

## CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

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EUROPEAN TECHNICAL REPRESENTATIVE

CYANAMID PRODUCTS LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W. C. 2, ENGLAND

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HYDRO-NITRO S. A., 8 QUAI DU CHEVAL BLANC, GENEVA, SWITZERLAND

CABLES: CHEMICONST, NEW YORK



*Chemico plants are profitable investments*

CC192

wedges. They are recommended for wide open or closed service on lines carrying water, oil, gas and steam, or any other service where bronze valves are applicable. Among the outstanding features of this valve series are their improved body-bonnet ring and pipe-end design, which affords easy installation and repair, along with their metallurgically controlled and processed copper-nickel alloy wedges that give longer trouble-free operation to OIC valves. The union bonnet design of these valves permits tight bonnet joints with quick easy disassembly for inspection, cleaning and repairs.

- A new, compact, quick-operating *air control valve* has been introduced by Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich. It is direct operated, using the standard Ross solenoid.

This capable new valve is  $\frac{1}{4}$ " pipe size, straightway or 3-way, with in-line, side, bottom or panel mountings. It is available in both normally open and normally closed models. The straightway units are suitable for the control of liquids since corrosion-resistant materials are used throughout.

- Worthington Pump and Machinery Corp., Harrison, N. J., has introduced a new cold process slurry type precipitating *water softener and coagulator*. Hydraulic energy mixes the applied chemicals with previously formed precipitate and optimum flocculation is achieved without use of submerged mechanical moving parts.

Complimentary recirculation of treated water maintains a uniform depth of slurry bed independent of load demand.

Where filters are used for final clarification, a washer reclamation compartment is incorporated to enable the filters to be economically backwashed with clean, chemically inert water without imposing increased flow rates through the softener.

- *Flexible stainless steel hose* is now being produced commercially in Carpenter Stainless No. 20, from Carpenter Steel Co., Union, N. J. Until now, flexible stainless hose has been available only in conventional analyses such as Types 304, 316 and 347.

Size range of the new flexible hose is from about 1" ID to 25 $\frac{1}{2}$ " ID in various gauges.

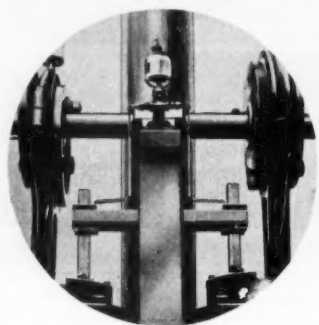
Fittings such as standard pipe size nipples, etc., can be welded to the ends of Carpenter Stainless No. 20 flexible hose, or the hose ends can be provided in non-flexible standard tube sizes for use with flanges, etc.

- Work in high-temperature and noxious atmospheres is made safer with the new *portable ventilators* developed by Mine Safety Appliances Co. Equipped with high-velocity fans powered either by gasoline or electricity, the new M.S.A. ven-

tilators provide both ventilating and cooling air, and can be wheeled from place to place on the job.

Air is conveyed to the desired point through a 14" diameter, 16' long canvas duct. Ducts are treated for flame and mildew resistance, and when not in use can be collapsed and folded into a compact bundle. A two-way air flow feature permits the duct to be connected to either the inlet or discharge side of the fan—allowing both dust or noxious gases to be drawn from the area, and fresh ventilating and cooling air supplied to the area.

- The Ralph B. Carter Co., 210 Atlantic St., Hackensack, N. J., has announced a new modified design optional for its entire line of plunger *sludge pumps*, which will result in greatly increased pumping efficiency and cuts maintenance "dowp



time." This exclusive new feature, the crosshead guide assembly, consists of a steel crosshead guide rod, rigidly secured to each plunger. The guide rod travels through bronze guide bearings in a vertical plane with the plunger. The bronze guide bearings are securely mounted on, and supported by, the vertical stanchion of the pump base; so the crosshead guide is located perpendicular to the eccentric motion of the connecting rod.

The main advantages of this design modification are to eliminate misalignment of the plunger and any tendency toward eccentric motion of the plunger in the vertical path. This reduces possibility of excessive wear on the packing gland as well as wear on the plunger and cylinder. Constant lubrication is provided by a sight feed oiler system.

- Development of a new weight-loaded *lubricator* has just been announced by Mixing Equipment Co., 1024 Garson Ave., Rochester, N. Y. The new lubricator is designed to deliver lubricant at constant pressure in any desired quantity. It may be used for greases and oils and Mixco engineers say it will decrease maintenance costs, improve equipment operation and lengthen machinery life. Typical uses are: application of lubricant to stuffing boxes of pumps and mixers, motors and engines, heavy machinery, farm machinery, line

shafting bearings, motorized and lubricated valves. Pressures may be applied to lubricants up to 150 psi.

Because the position of the lubricator arm gives an exact indication of the amount of lubricant in the cup, positive warning is given when the lubricant supply runs low. Grease cup, with a capacity of 7 $\frac{1}{2}$  ounces, has a conical bottom to facilitate lubricant passage.

- The new *packaged liquid cooler* of Doyle & Roth Mfg. Co., foot 23rd St., Brooklyn 32, N. Y., can usually be installed in as little as 24 hours. It is fabricated of construction materials specified by the customer and includes a heavy-duty Freon compressor, motor and starter, and the necessary controls. The shell-and-tube liquid cooler and refrigerant condenser are designed for the specific operation.

It is completely shop-assembled and is available in sizes from 5 to 100 daily tons of refrigeration. Its operation is usually limited to operations above -80° F. unless it is used for prestaging.

- A new *conductivity bridge*, Solu-Bridge, for reading direct the concentration of hydrochloric acid solutions is available from Industrial Instruments, Inc., 17 Pollock Ave., Jersey City 5, N. J.

Model RD-20C Solu-Bridge covers the range 1-20% HCl and contains a manual temperature compensator of range 64-190° F. This new bridge is line-operated and incorporates a 3000 cycle bridge source oscillator.

- *Pulsafeeder proportioning pumps*, of Lapp Insulator Co., Inc., LeRoy, N. Y., are now available with the "Auto-Pneumatic" control system which provides for pneumatic instrument control of Pulsafeeder output. Automatic volume change from zero displacement to full displacement is provided, automatic and in response to instrument air pressure change.

- A new *shaft and pump packing*, produced by United States Gasket Co., 602 N. 10th St., Camden, N. J., is completely non-corroding and non-contaminating. Made with alternating rings of solid, unoriented Teflon and of graphite or mica combined with Teflon, this Chemiseal #711 packing is particularly adapted to applications where chemical attack from solvents, acids or alkalis or contamination of the product is a serious problem.

- Warren Steam Pump Company, Inc., Warren, Mass., is producing a new *two stage pump*, Type TL. This new line includes such construction as water cooled, duplex, angular contact ball thrust bearing, labyrinth type seal, heavy, horizontally split casing with flanged bearing supports, inter-stage seal against by-passing, only suction pressure on both stuffing boxes, renewable protective shaft sleeve,

# Bagpak



designed and serviced by the manufacturer of BAGPAK Multiwall Bags

Who but a manufacturer of multiwall paper bags is best equipped to design and service bag packaging machinery? Automatic advantages of faster, more efficient packaging come with automatic BAGPAKERS . . . that's why we say —

**if you want**

a packaging machine that sews a multi-wall tighter and faster — rely on a BAGPAKER . . .

**if you want**

an automatic machine that weighs, fills, settles and seals better — rely on BAGPAKER . . .

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a real performer — a dependable machine that boosts and maintains production rates — rely on BAGPAKER.

BAGPAKERS and Bagpak Multiwall Bags are ideal for packing food, chemicals and fertilizers. Write for our booklet 200B—it will give you added information on these money- and labor-saving machines and multiwall bags.



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220 East 42nd St., New York 17, N. Y.

BRANCH OFFICES: Atlanta, Baltimore, Boston, Chicago, Cleveland, Baxter Springs, Kansas, Los Angeles, New Orleans, Philadelphia, Pittsburgh, St. Louis, San Francisco.

In Canada: Continental Paper Products, Ltd., Montreal, Ottawa.

and hydraulically balanced, back to back impellers. Capacities to 825 gpm, total head feet to 800.

- The Handy-Handler, a new general-purpose industrial conveyor, unique in its versatility and unusual light weight, is now being produced by the Belt Corp., Orient, Ohio.

This new conveyor was designed to deliver stoker coal, salt, gravel, sand and similar bulk materials, yet be portable in the real sense of the word. Constructed of tough 61ST6 aluminum alloy, the Handy-Handler may easily be carried and positioned by one man. The lightest of several available models weighs but 119 pounds with 2 HP gasoline engine.

The conveyor is available in lengths from 10 to 20 feet, according to Belt en-

gineers. Standard 16-ft. model may be increased to 20 feet by inserting a four-foot midsection when additional reach is required.

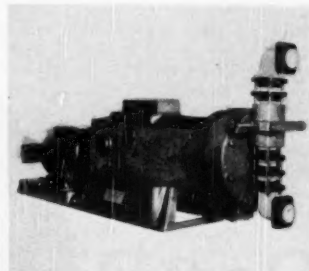
Models are available with choice of three electric motors and three gasoline engines. Easily-removable engine mount is adaptable for all power units. Buyers may select either rubber flights and continuous rubber belt or steel flights and chain.

- The F. J. Stokes Machine Company, 5900 Tabor Road, Philadelphia, Pa., has added a new McLeod type *high vacuum gage*, with a working range of .05 to 50 mm. Calibrated in millimeters, the lowest scale division is .01 mm. (10 microns).

The wide range of this new vacuum gage fills the gap between present low

range vacuum gages and dial type measuring instruments. The gage performs excellently in applications subject to excessive contamination during operation and is housed in a plastic case.

- The Process Equipment Division of Lapp Insulator Co., Inc., LeRoy, N. Y., is now making a new line of its Pulsafeeder chemical *proportioning pumps*



with ceramic wet-end parts. In this new model, reagent-head, valves, and valve housing are armor-encased solid porcelain; gaskets, valve seat, and diaphragm are of inert fluorinated hydrocarbon plastics (Teflon and Kel-F). It allows for successful handling of all concentrations of all acids other than HF, all metal salts other than strong caustics, chlorinated hydrocarbons, halogens and liquids which must be kept sterile or free from metal ion contamination.

All standard Pulsafeeder sizes are offered in the new head construction . . . capacities up to 330 gals. per hour. Maximum discharge pressures are 100 psig for large unit, 250 psig for small unit.

- Developed by T. Shriver & Company, Inc., Harrison, N. J., to permit filtration with the filtering surfaces in a horizontal position, their new *tilting filter press* also allows cleaning with the plates and frames in the usual vertical position.

This unit offers the advantages of horizontal plate filtration, where filteraids and cake constituents may flow evenly to deposit a uniform cake over the filter surface which will not be disturbed should the flow of feed be cut off at any time. Intermittent filtration does not disturb the filter-aid precoat, or the filter cake proper. Yet, when the time comes for cleaning the filter, with the plates and frames in the normal vertical position, the usual procedure for cleaning and reassembly is easily followed.

- A new *vacuum gage* for measurements in the range 1 to 1000 microns is available from the Hastings Instrument Co., Hampton, Va. The new gage embodies a noble-metal thermopile and consists of an accurate electrical indicator and a small rugged pickup which screws into a 1/8" tapped hole in the vacuum system. Fast response, interchangeability of pickups

**By any standard  
of measurement  
Tygon flexible  
plastic Laboratory  
Tubing has  
achieved top ranking  
among America's  
leading chemists**

•

**Flexible  
Non-toxic  
Glass clear  
Resistant to virtually  
all acids, alkalis  
Non-aging  
Sterilizable  
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laboratory  
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# You specify the service... We'll supply the RIGHT valve

This may sound like a broad statement, but we can prove it. Because of the completeness of the Powell Line, we are always able to supply the *right* valves to meet the requirements of every industrial flow control service.

You specify the conditions under which the valve must operate. Usually your Powell distributor will know which is the right Powell Valve to meet them. If the conditions present a problem he can always consult Powell Engineers, or if you prefer, write to us direct.

At all events be sure you install the *right* valves—it's easy to do with the Powell Line.\* Failure to do so will mean faulty performance instead of the long, trouble-free operation you can expect from the right Powell Valves.



Fig. 1843—200-pound Monel Metal Swing Check Valve with screwed ends and screwed-in cap.

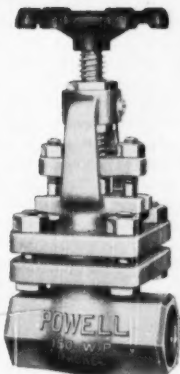


Fig. 1979-NI—150-pound Nickel Globe Valve with screwed ends, bolted flanged yoke-bonnet and outside screw stem. 4-bolted flanged bonnet Angle and Gate Valves in this design are also available.

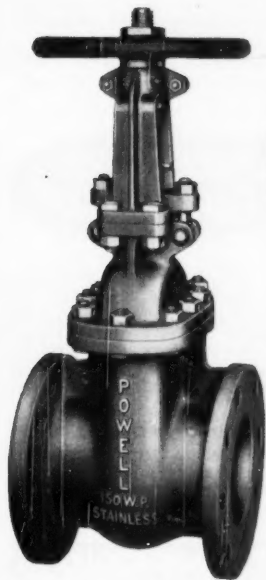


Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve with bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Made in sizes 5" to 30", inclusive.

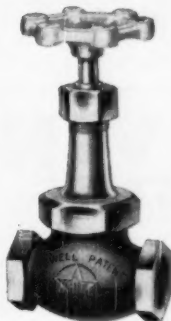


Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

\*The Complete Powell Line includes Globe, Angle, Gate, Check, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-Resisting metals and alloys.

Ask your nearest Distributor—or write direct

**The Wm. Powell Company**  
Cincinnati 22, Ohio

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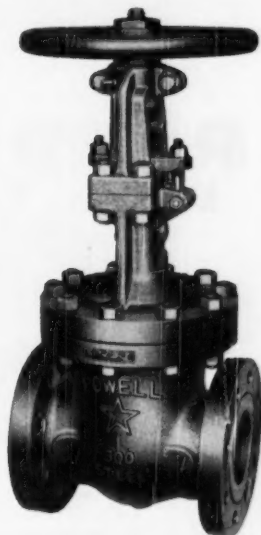


Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem, tapered solid wedge.

# POWELL VALVES

without recalibration, freedom from outgassing and corrosion, and freedom from damage by exposure to atmospheric pressure are outstanding features of the new gage. Calibration is not affected by connecting cable length, thus allowing remote indication and recording.

- A new type conveyor belt for conveying hot materials is being produced by Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown 1, O. The new Rubber-Glass conveyor belt features a carcass constructed with multiple plies of glass fabric plus covers specially compounded to resist heat.

In a large foundry installation at temperatures up to 400° F the new belt has already given over 14 months' service. On this operation, 10 weeks' service was considered good on regular hot material belts.

- By using an ingenious double fulcrum point and venting mechanism Clark Mfg. Co., 1830 E. 38th St., Cleveland 14, O., has increased the drainage capacity of its steam traps so that it may handle twice the condensate formerly possible.

- A new Fiberglass molded pipe insulation for temperatures up to 800° F., is available from Owens-Corning Fiberglass Corp., 16 E. 56th St., New York 22, N. Y. Known as Fiberglass PF pipe insulation, Type 80, the new product is made of

glass fibers bonded by a thermosetting binder molded in cylindrical form in all standard sizes up to 30". The 800° temperature limit of the new pipe insulation represents a 200-degree advance over the maximum limit of the earlier Type 60 insulation.

The new product is available with a 4-ounce canvas cover as a standard stock item. It can be supplied with a heavier canvas cover, or with a 35-pound roofing felt jacket.

- Type 1701-A Variac speed control, a product of General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass., is a simple, compact, low-power controller similar in design to the 1/2 h.p. Type 1700-A Variac speed control previously announced. This new model controls a 1/20 h.p. d-c shunt motor or a 1/45 h.p. universal motor directly from a-c line. Range of continuous speed variation available is from motor rated speed down to nearly zero at constant torque. A working range of 30:1 can be obtained with shunt motors and of at least 50:1 with most universal motors.

The motor can be reversed almost instantly by merely flipping the forward-reverse switch. No time delay is necessary in starting or in reversing. The controls are housed in a metal cabinet approximately 6 3/4 x 5 3/4 x 4 3/4 inches and weighing only 6 pounds.

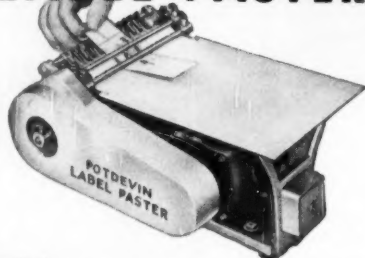
Two models of the Type 1701-A Variac speed control are available: Type 1701-AK, for operating a 1/20 h.p. d-c shunt motor, and Type 1701-AU, for operating a 1/45 h.p. universal motor.

- The Niagara "Controlled Humidity Method" is a new system of air conditioning giving complete control of temperature and relative humidity, holding constant conditions or varying them at the will of the user. Especially, it provides dry air at normal atmospheric temperatures with little or no refrigeration required. A condition of 15 grains of moisture per pound of air at 85° F. dry bulb temperature has been produced without refrigeration.

The apparatus is enclosed in a casing through which the air is drawn by fans. The air is filtered and then enters a chamber where it is dehumidified in passing through a spray of "Hygrol" Liquid (a hygienic hygroscopic chemical that absorbs the air-borne moisture and contains no salts or solids to precipitate). In the same chamber are located cooling coils which remove the latent heat of evaporation and also do any sensible heat removal that may be needed. The air stream then passes through entrained moisture eliminators and is diffused in the space to be conditioned.

The absorbent liquid spray falls into a tank at the base, from which it is piped

## POTDEVIN LABEL PASTERS



Four models—6, 8 1/2, 12 and 18 inches (hand and motor driven)—to label any size or shape of container, with any style of label. POTDEVINs are quick and clean. Sticks permanently to glass and metal surfaces. POTDEVIN's patented glue regulator controls amount of adhesive, eliminating excess and keeping ungummed side perfectly clean.

**FREE TRIAL OFFER!**

*Convince yourself at our expense.*

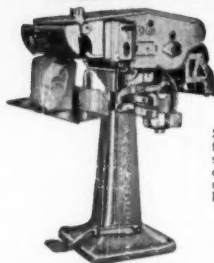
**POTDEVIN MACHINE CO.**

1202 38th St., Brooklyn 18, N. Y.

Designers and manufacturers since 1893 of equipment for Bag Making, Printing, Coating, Gluing and Labeling



## SEALS FILLED BAGS QUICKLY ECONOMICALLY!



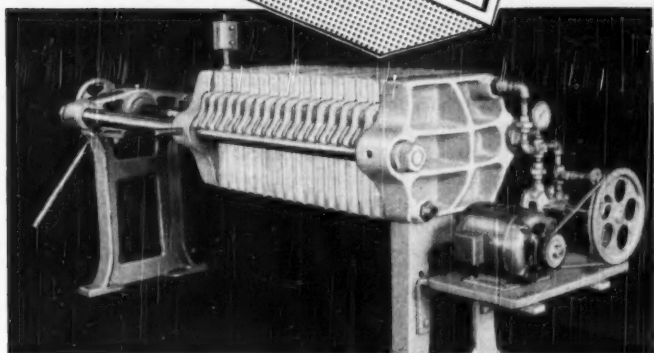
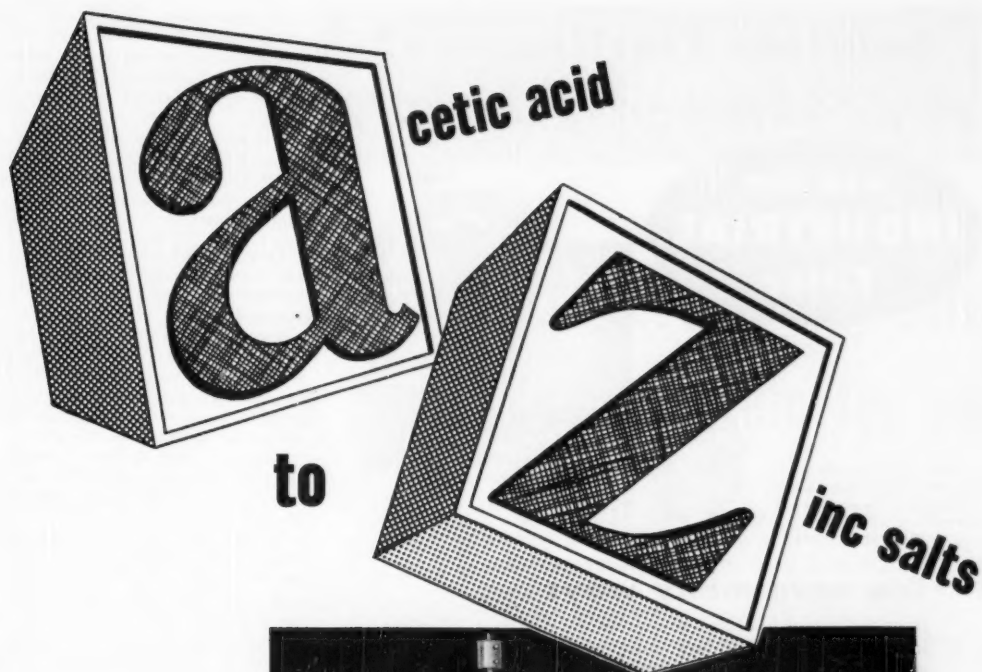
One operator produces up to 75 sift proof closures per minute—paper bags, bags with liners, glassine bags, up to 10" wide—with a SARANAC Bag Sealer. A single pass through the SARANAC forms a stapled double reverse fold that is the strongest part of the bag. The same machine is used to close the bottom of empty bag cubes. Write for free illustrated bulletin and ask about the SARANAC Proposition.

**Saranac Machine Co.**  
BENTON HARBOR, MICHIGAN

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CHEMICALS

WITH OUR VERY  
**BEST WISHES  
FOR THE NEW YEAR**

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CABLE ADDRESS "ROBEC"



**P**ERFECTION IN FILTRATION covering the whole alphabet of filtered chemicals and other products... that is Sperry's record. Based on over a half-century of experience combined with a thorough understanding of today's techniques, this perfection in filtration means a finer quality product at lower cost.

Investigate the Sperry Plate Filter Press today. Discuss your filtration problem with Sperry and find out how the advantages of low first cost, plus ease and flexibility of operation and low labor cost, can be applied to your own particular manufacturing process. Sperry engineers are always at your service.

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*Filtration Engineers for Over 50 Years*

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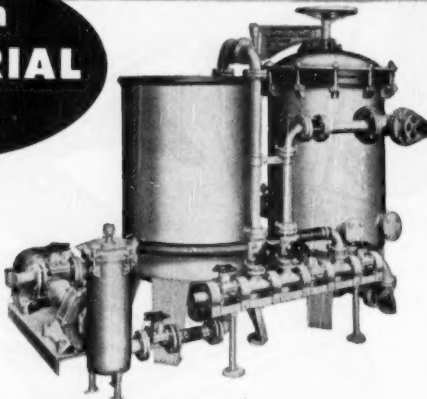


**SPERRY**  
**FILTER PRESSES**

# Solution Clarification? Any Solution-Any Quantity

use an  
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Filter**

100 to 15,000 gallons per hour.  
Portable and stationary models.  
Standard or special filtration  
systems engineered to meet  
unusual requirements.



## You save many ways . . .

Here's how Industrial filters keep down filtration costs—The flow rates of Industrial filters are based on the solutions involved. You know the capacity you get. With Industrial you get an adequate filter with slurry tank, motor driven pump, valves and fittings in a complete package with one, undivided, experienced responsibility—with space requirements at a minimum.

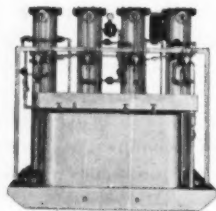
The labor, down time, and the inconveniences of cleaning, replacing the filter media, and reassembling the filter for every new filter cycle—all are eliminated by the Industrial Air-Wash Cleaning Method available for all models. It is necessary to remove the cover only when new filter cloths are installed.

The engineering, design, and construction of Industrial filters have proved out in long service and low maintenance costs. Industrial has the experience and is large enough to handle your filter requirements. Since 1927 filters and filtration systems have been an important part of our business.

**INDUSTRIAL  
Water  
Demineralizers**

for Chemically pure water at  
a few cents per 1000 gallons.

Write for full information  
and recommendations



A four-bed Industrial Water Demineralizer.  
Standard two- and four-bed units available with  
capacities of 200 to 1000 gph. Special units of any  
capacity engineered to requirements.

## INDUSTRIAL FILTER & PUMP MFG. CO.

1631 West Carroll Avenue  
Chicago 12, Illinois

FILTERS Pressure Type	PUMPS Centrifugal	CORROSION TESTING APPARATUS Salt Fog • Humidity
RUBBER DIVISION Vulcanized Linings • Molded Products		WATER DEMINERALIZERS

to a concentrator which removes the moisture taken from the air. The concentrated liquid returns to the system. This process is continuous, and the apparatus operates at full capacity at all times.

This equipment is manufactured in a range of sizes providing from 1000 to 20,000 CFM of conditioned air from a single unit, and multiple unit installations are practical.

• Lyon-Raymond Corp., Greene, N. Y., has introduced a continuous-acting air-operated pump similar in design to its recently introduced single-acting pump.

In operation, the new air motor is so arranged that it runs continuously merely by holding open the valve which controls the air supply. A reciprocating valve alternately diverts air pressure from one side of the air piston to the other.

A relatively large air piston is directly connected to a small hydraulic piston which pumps oil under high pressure. Working oil pressure of 1000 p.s.i. can be obtained from a 90 p.s.i. air pressure. Higher working pressures are also available. The displacement of oil per stroke-cycle is 3.4 cubic inches. 1.0 to 1.5 gallons of oil can be pumped per minute depending on the air pressure. Air consumption is 3.5 CFM (90 p.s.i.) at an average pumping rate.

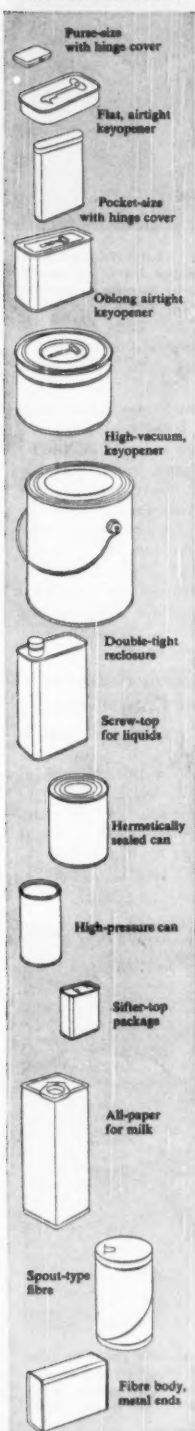
• An electronic temperature control instrument, sensitive to temperature changes of 0.1° F., has been developed by Minneapolis-Honeywell Regulator Co., 4427 Wayne Ave., Philadelphia, Pa.

The new device will control industrial processing temperatures from -20° to 300°. The new control, No. 077, is immune to vibration, dust and dampness and may be used with indicating or recording instruments.

The new control depends on the resistance of a wire-wound sensing element, which varies in proportion to the temperature of the control medium. The sensing element forms one leg of a Wheatstone bridge and any minute temperature change unbalances the bridge. The bridge unbalance is imposed on an electronic amplifier which amplifies and detects the direction of the unbalance to operate either of two output relays, according to the direction of the temperature change.

• Designed for rapid, accurate polarographic analyses, a new L&N Type E Electro-Chemograph manufactured by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., features one-piece console design incorporating a built-in Speedomax Recorder. Like the previous model, the Electro-Chemograph automatically plots diffusion current as a function of voltage. Now, however, the data-taking is done by a Speedomax microampere recorder, which provides greater speed.

**WHICH PACKAGE  
SUITS YOUR PRODUCT?**



# VERSATILITY..that may solve a packaging problem for you

On this page you see thirteen different types of containers, adaptable to hundreds of different packaging problems and in actual use by scores and scores of different industries.

What you do *not* see here are the many *other* types of containers pioneered and developed by Canco.

Now—add it all up—and you get *versatility*, the art of being many-sided, in creating packages for hundreds of specific packaging problems.

This art has been practiced by Canco since 1901.

There is hardly a major development in metal and fibre packaging that this keen, alert organization has not pioneered.

When you remember that Canco service also includes advice on processes, filling, closing, label design, and marketing, you can see that there are definite advantages to doing business with a versatile package manufacturer.

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# AMERICAN CAN COMPANY

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# PACKAGING & SHIPPING

by T. PAT CALLAHAN

## Polyethylene's Star on Rise as Packaging Lining Material

POLYETHYLENE-COATED PAPER is fast becoming one of the most important linings for all types of packaging. The development of polyethylene-lined multiwall bags as well as liners of polyethylene laminated to paper, fibreboard, and textiles makes available a material with ideal properties for packaging a wide variety of chemical products. It is odorless, non-toxic, moisture-proof and flexible at low temperatures. Moreover, its ability to be heat-sealed in a case, bag or drum recommends it as a lining for hygroscopic materials.

The availability to the chemical industry of this resin in combination with long-established materials to provide superior packaging is the result of development work carried on by chemical companies in conjunction with paper, textile, and container manufacturers. Some months ago, for example, St. Regis Paper Co. announced that its Research and Development Department, working in conjunction with technicians of the DuPont Co., had developed a new process for coating kraft papers with synthetic resins, most notably polyethylene. With its new coating operation in production, St. Regis reported that it was in a position to provide, on an economic basis, a multiwall bag containing a sheet of kraft paper coated with polyethylene for many heretofore unpackable or hard to pack materials. Polyethylene-coated multiwall bags are now available or soon will be from other suppliers as a result of similar joint efforts.

### Success with Multiwalls

Multiwall bags containing polyethylene coatings have been in commercial use for well over a year and the success attained has indicated that the improved moisture and grease-proof protection provided by bag walls coated with this synthetic resin marks an outstanding advance in the technology of multiwall bag construction.

The polyethylene coating is said to be the best yet developed in the field of paper coatings for packaging purposes. Polyethylene to a substantial degree is unaffected by acids and alkalis, provides an excellent grease and oil barrier and is odorless, tasteless and non-toxic. In addition it also strengthens the sheet to which it is applied. Among materials successfully packed in such bags are calcium chloride, powdered skim milk and synthetic resins.

Experiments have revealed that by

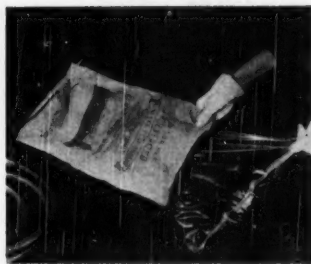
coating the polyethylene on the inside there can be prevented abrading of the paper fibres by the sharp corners of the resin granules, thus preventing contamination of the resin by the paper fibres.

Laboratory and shipping tests with calcium chloride revealed that four-wall multiwall bags employing 1 polyethylene coated ply are equal to or even a little more effective than a five-wall multiwall bag employing 2 asphalt laminated plies. Laboratory and field storage tests also showed that a single polyethylene ply proved more than twice as good as a water-vapor barrier than 2 AL plies.

Results of tests conducted by the U. S. Ordnance Department on ammonium nitrate stored in asphalt laminated and polyethylene coated multiwall paper bags were two to one in favor of a multiwall bag with a polyethylene coated ply.

### Other Packages

Considerable work is now being done by many large manufacturers in the development of polyethylene liners for types of packages other than the multiwall bag, and it appears that a satisfactory solution to many difficult packaging problems has now been accomplished or will be accomplished in the very near future. The application of extruded tubes or flat sheets



**Moisture - proof, bacteria - resistant, flexible polyethylene liner for multi-wall bag keeps peat humus in natural state, protects outer bag.**

heat-sealed as liners is also becoming a major factor in the packaging of chemical products.

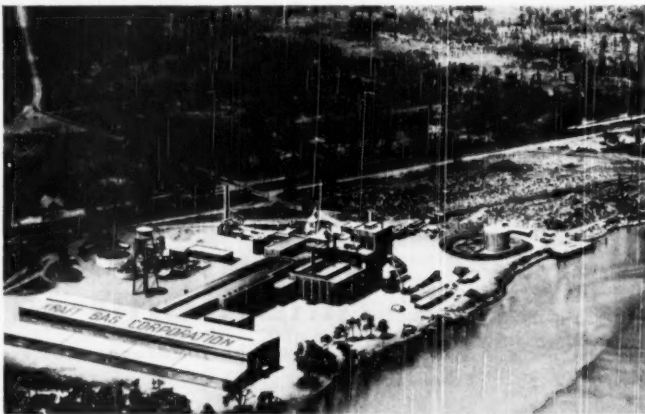
A lining for metal drums has now been developed and is being used by several companies in drums up to 55 gallons.

A special committee of the Manufacturing Chemists' Association is now studying the use of plastic linings for fibre drums for viscous and liquid materials. When satisfactory liners of this material have been developed and approved, they should make this container a very acceptable one for shipping such products.

### Tote Box System Solution For Odd-Sized Containers

Often when a particular package is shipped to a customer, he writes back that he would prefer a different form of container because he has use for it in storing finished material in his plant. This works a serious hardship on the

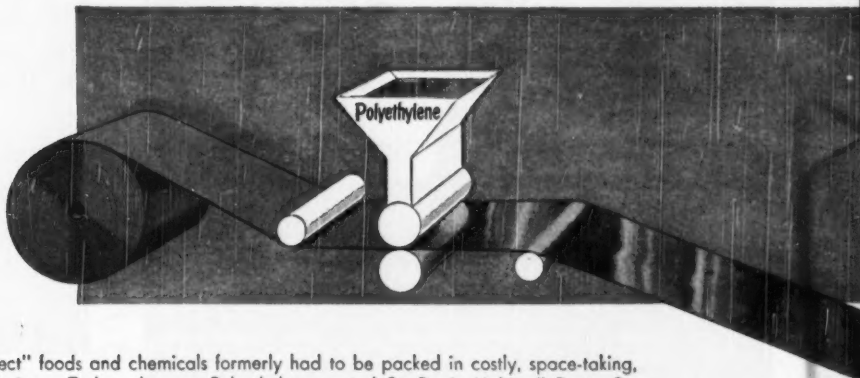
### New Pulp and Paper Mill



**Airview of the pulp and paper mill of St. Marys Kraft Corp. and the new conversion plant of Kraft Bag Corp. now in full operation at St. Marys, Georgia. In foreground is the new Kraft Bag factory, where multi-wall shipping sacks are produced. The mill converts slash pine into pulp, turns out Kraft paper for shipping sacks, wrapping and other paper products.**

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St. Regis Polyethylene-treated Multiwalls are highly resistant to greases, oil, moisture, alcohol, alkalis and most acids. They retain their characteristics under wide temperature variations. The plastic coating on an inner layer of the kraft paper is inert, non-toxic, odorless, and gives still greater tearing strength to the tough Multiwalls.

The economy of St. Regis Polyethylene Multiwalls barely begins with their lower price. The savings extend to lower storage, freight and packing costs, to lower container tare-weight, and to lower handling cost with Multiwall Paper Bags. One chemical company found that a single carload of empty Multiwalls equalled the container volume of ten carloads of the packages formerly used — saving \$15 on each car run into the company's yards!

For detailed facts on the suitability of St. Regis Polyethylene-coated Multiwalls for your own packaging operations, write to the nearest St. Regis Sales Office, outlining the nature of your product and your packaging problems.



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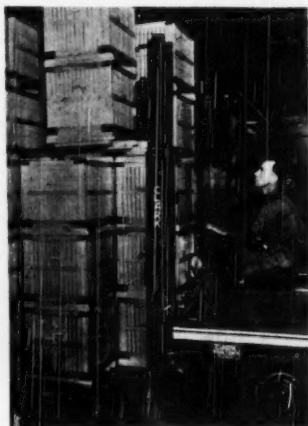
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chemical supplier as he is set up to ship in a particular package and is unable to provide material in packages which meet individual requirements for plant use. A convenient way to handle such requests is for the manufacturer to recommend that the customer establish some form of tote box system; then he has uniform containers to handle his finished product within the plant.

The work of Clark Equipment Co., Battle Creek, Mich., in solving a problem of




the National Pressure Cooker Co., Eau Claire, Wis., shows what can be done in this respect. When time-studies revealed that parts in process were moving too slowly in operation, with a resultant bottleneck, skid-boxes designed for use with fork trucks were installed (see cut).

The skid-boxes selected are of uniform size, replacing containers varying widely from wooden boxes of many sizes to corrugated cartons. The skids fit into the box below, and can be tiered five-high in neat rows. The light, strong, easy-to-handle skid-boxes and the fast, maneuverable fork-lift trucks make an ideal team for smooth, low-cost production.

### **Packaging Emphasis On the Increase**

The quarterly Industry Report on Containers and Packaging for the winter 1949, issued by the Office of Domestic Commerce, United States Department of Commerce, Washington 25, D. C., brings out many salient points in connection with the over-all picture of containers and packaging. This report states that 1949 unquestionably saw more container users becoming alive to the need for distinctive packaging, and 1950 should see a continuation of this trend.

Prospects for growth in the container and packaging field appear to be extremely favorable. The rewards for imagination and initiative as applied to sales producing packaging, will be greater than ever.



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**P.S.** Continental also makes steel containers in a wide variety of sizes for bulk shipments.

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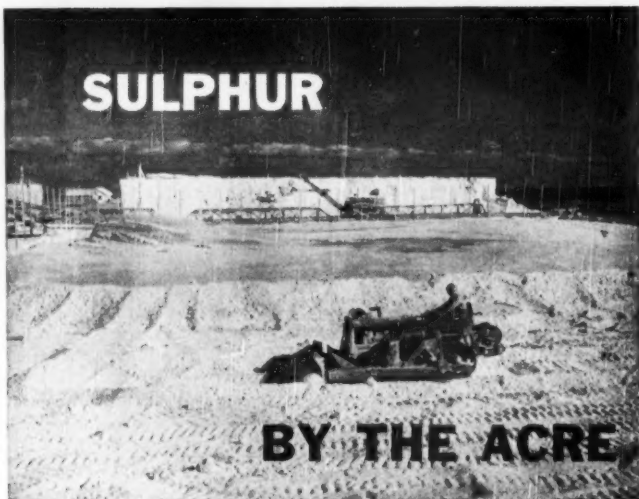
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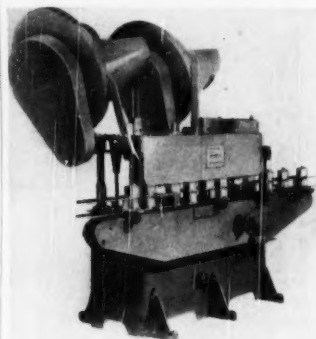
**SULPHUR SERVES INDUSTRY**

This review also contains a digest of local container trends and current conditions as reported by Commerce Department field officers covering the West Coast Area, Southwest Area, Midwest Area, North Central States Area, South and Southeastern Area, Middle Atlantic States Area, New York Area and New England Area.

A very comprehensive study of trends and developments in the manufacture and use of textile bags and an article on Burlap Background and Developments by A. Henry Thurston, chief, Textile and Leather Division, make this industry report on containers and packaging very helpful to all interested in packing and shipping chemicals.

#### **Automatic Capper**

Resina Automatic Machinery Co., Inc., New York, N. Y., is now in full-scale production of its fully automatic U-Press-it



Capping and Banding Machine. U-Press-it closures, which have been in use throughout industry for many years in the capping of turpentine, paint, oil, and varnish cans now may be applied to the cans automatically from start to finish. Cans go right into the capper and bander directly from the filling machine without the aid of human hands.

The Resina U-Press-it machine is easily adjusted to change over from one size to another and can handle pint and quart sizes at the rate of 85 per minute, and gallon cans up to 40 per minute.

#### **Yale & Towne Establishes Chicago Service Center**

The Yale & Towne Manufacturing Co. recently opened a new Chicago regional materials handling sales and service headquarters in a new 2-story building erected for the purpose at 815 N. LaSalle St.

The opening of the new building in Chicago greatly assists manufacturing, warehousing and transportation industries in the midwest to reduce operational costs, because it provides a complete spare parts and repair service within an hour of the industries in the Chicago area for emergency service.

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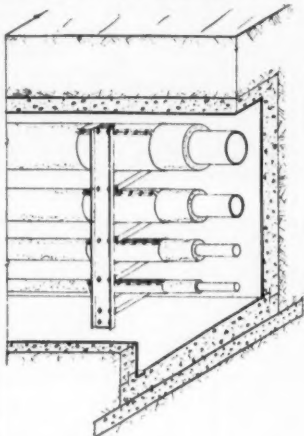
## PLANT OPERATIONS NOTEBOOK

### Insulating Pipe Supports To Reduce Heat Losses

Insulated pipe supports cut down heat lost by conduction through the support.

To prevent excessive heat losses due to direct metal-to-metal contact between hot pipe surfaces and structural supports, so-called insulated supports may be used. In this type of installation, developed by Sargent & Lundy, Engineers, from test work done at the University of Illinois, the entire length of piping is insulated in the usual manner and then supported by hangers or by channel irons.

Where the piping is to be supported by a hanger, a No. 10 gauge steel plate,



Piping, insulation, bands and channel supports, as installed in underground conduit.

its length proportioned to the load to be carried, is rolled into a band to fit the insulated pipe and provided with a flange for assembly. A saddle plate,  $\frac{3}{4}$ " thick, is then tack welded around the lower half of the flanged band, to assist in carrying the direct load and in spreading it over a wide area. The unit is then bolted in place around the insulated pipe, a filler bar is fitted over the upper half of the flanged band, and the usual hanger strap is fastened around the entire assembly.

Where the pipe line is to be supported by channel irons, a 16-gauge sheet metal band, 18" long and flanged for assembly, is bolted around the insulated pipe at each point of support.

Since the pipe rests on the insulation at the supports, the insulating material used must be able to bear the weight of the pipe. On the basis of the tests con-

ducted at the University of Illinois, a loading capacity of 10 lb. per sq. in., or 100 lb. per running in. of line, has been established for 85% magnesia.

### Built-in Fire Protection

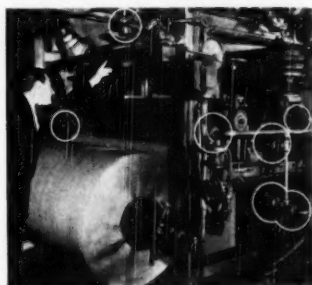
The Firestone Tire & Rubber Co., Akron, Ohio, recently installed an automatic carbon dioxide fire extinguishing system on its large rubber-impregnating machine used to manufacture nylon tire fabric. Believed to be one of the largest and most comprehensive automatic extinguishing systems for machinery of this type, the installation was designed and made to order by Walter Kidde & Co., Inc., of Belleville, N. J.

As the rubber cement used to impregnate the 60" wide nylon fabric—moving at 10' per minute—contains a large percentage of highly flammable solvent, a built-in extinguishing system was selected.

Two heat actuators—one at each end of the machine—work on the rate-of-temperature-rise principle to detect fire almost instantly. The actuators are connected by tubing to a special pressure release mechanism which controls automatic discharge heads on the carbon dioxide storage cylinders.

In case of fire, twenty multijet discharge nozzles, located at hazard points throughout the machinery engulf the nylon impregnating machine in a blanket of inert carbon dioxide gas from a manifold of four 50-lb. cylinders.

The Kidde extinguishing system also has four pressure-operated trips to close duct dampers, automatic explosion-proof switch to cut off power to the electrically driven machinery, and two remote control pull boxes for manual operation of the system for added safety.



Twenty multijet nozzles located at danger points throughout Firestone nylon impregnating machinery stand ready to envelope the unit with inert, fire-killing carbon dioxide.

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For the first time, accurate and comprehensive data on the enthalpy of liquid chlorine has been developed. It is presented in a chlorine reference book just published by DIAMOND ALKALI. Many new charts and tables on the fundamental properties of chlorine are also included in this handbook.

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## NOMOGRAPH-OF-THE-MONTH Edited by DALE S. DAVIS

### Thermal Conductivity of Liquid Silicones

by D. S. DAVIS  
Virginia Polytechnic Institute  
Blacksburg, Virginia

THE growing industrial importance of dimethyl siloxane polymers prompted a recent study of their thermal conductivities by Bates (1) who correlated kinematic viscosities, temperatures and thermal conductivities by the equation

$$K = 57.75 (10^{-6}) \left( \frac{4.66 + \gamma - 0.000003\gamma^2}{8.00 + \gamma} \right) (1645 - 0.555t)$$

where  $K$  = thermal conductivity, B.t.u./  
(hr.) (ft.) ( $^{\circ}$ F.)

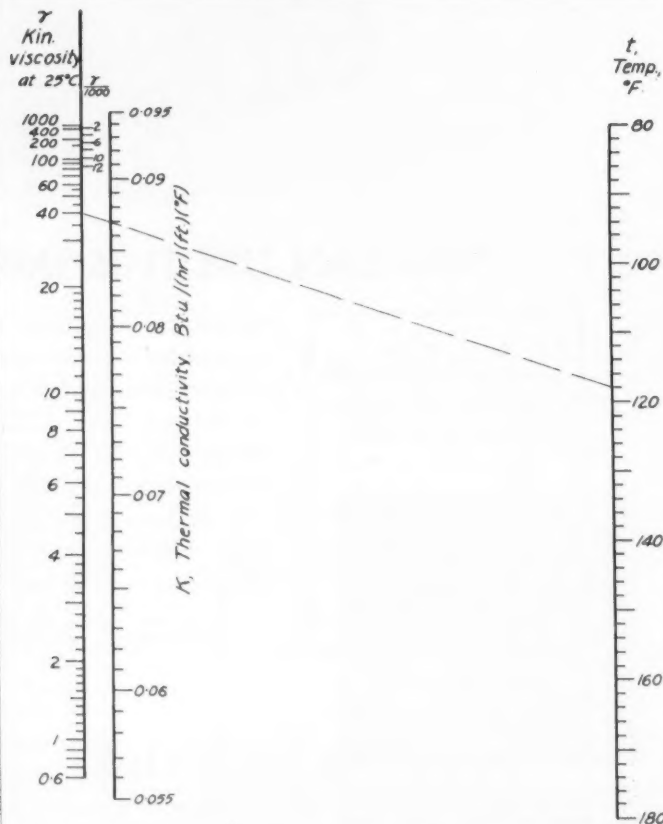
$\gamma$  = kinematic viscosity at  $25^{\circ}$ C.  
in centipoises

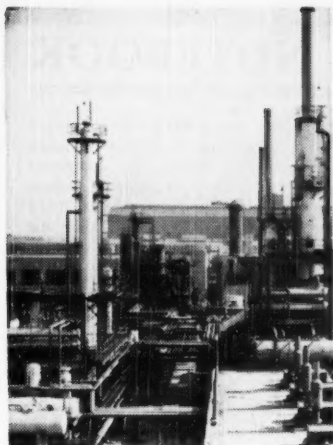
and  $t$  = temperature,  $^{\circ}$ F.

The equation can be solved conveniently and accurately by means of the accompanying nomograph which was constructed by methods described previously (2). The use of the chart is illustrated as follows: What is the thermal conductivity of a liquid silicone at  $118^{\circ}$ F. when the kinematic viscosity at  $25^{\circ}$ C. is 40 centipoises? As indicated by the broken line, connect 40 on the  $\gamma$  scale with 118 on the  $t$  scale and note the intersection with the  $K$  scale at the desired value, 0.0870 B.t.u./ (hr.) (ft.) ( $^{\circ}$ F.).

#### Literature Cited

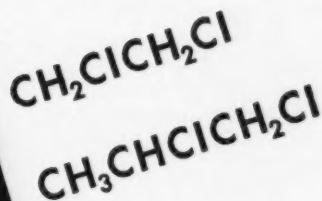
- (1) Bates, O. K., Ind. Eng. Chem., 41, 1966 (1949).
- (2) Davis, D. S., 'Empirical Equations and Nomography,' Chap. V. New York, McGraw-Hill Book Co., 1943.





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## LABORATORY NOTEBOOK

## Rare Chemicals

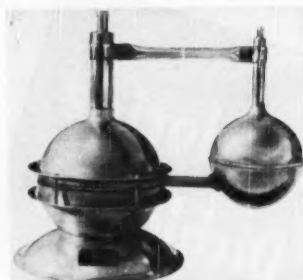
The National Registry of Rare Chemicals, 35 W. 33rd St., Chicago 16, Ill., is searching for the following materials:

Isatin chloride  
Selenophenol  
Cyclohexylcyclopentane  
9-Hendecenoic acid  
Methylene sulfate  
Homoterephthalic acid  
2,3-Dimethylmaleic anhydride  
Benzylsulfonfyl chloride  
Dimethyldibenzylammonium hydroxide  
2-Methyladipic acid  
1,2-Dichlorooctadecane  
1,3-Butylene oxide  
Ethanesulfonic acid  
2-Phenyl-1,3-indanedione  
Ribose 5-phosphoric acid  
Trifluoromethyl iodide  
3,5-Dimethylcyclohexanol  
Soya lipase  
Eriodictyol  
7-Aminoquinoline-5-carboxylic acid

## Liquid Hydrogen Container

New container permits storage of liquid hydrogen and helium.

A new container for the storage and transport of liquid hydrogen and liquid helium is available from Hofman Labo-



Hofman liquid hydrogen container.

ratories, Inc., 212 Wright Street, Newark, N. J. Because these gases present unusual handling problems in their liquid state, suitable vessels of any kind have never before been commercially available.

The Hofman liquid hydrogen container (U. S. P. 2,453,946) is made of three concentric copper spheres. The inner and outer spheres form a conventional vacuum flask, with facing interior surfaces polished to a mirror-like finish. Between them is placed a third sphere, highly polished on both sides, which acts as a radiation shield. This shield is attached by a unique connection to the inner sphere of a smaller side flask for containing liquid nitrogen.

The simple principle used in this design is readily understood. Since liquid hydrogen boils at an extremely low temperature ( $-254^{\circ}\text{C}.$ ), it rapidly returns to its gaseous state even when placed in a conventional vacuum flask. This new container by Hofman Laboratories greatly

limits this action by providing a cold barrier in addition to vacuum insulation and reflective surfaces. By conduction the radiation shield of the main flask is cooled to the temperature of the liquid nitrogen in the side flask. Thus the evaporation losses of liquid hydrogen (or helium) in storage and handling are reduced to a negligible minimum.

Liquid hydrogen containers are available in three standard sizes, 10, 25 and 50 liter capacities with side flasks holding 5, 15 and 25 liters respectively. Other sizes can be supplied on request. The main flask is fitted with an outer protective casing and base of spun aluminum.

• A new and improved model of their absolute and differential *manometer* has recently been introduced by the Emil Greiner Co., 22 North Moore St., New York 13, N. Y.

The improvements to be found in the new model are: Added protective bracket for the stopcock; rod on back of stand for mounting on a frame; new metal rod to carry the vernier now mounted on a block containing a U cut out to eliminate parallax; a special hollow ground high vacuum stop cock is now used on the glass part.

The improved manometer changes the arduous task of cleaning and filling a closed end manometer to the relatively simple process of cleaning and filling an open end U-tube type. Only a simple reading is required to obtain a precise measurement automatically corrected for ambient temperature and reduced to a height of mercury at  $0^{\circ}\text{C}.$

• The new container for the Emil Greiner Co.'s Aque, surface agent for cleaning laboratory glassware is a reusable *polyethylene bottle dispenser*.

Once the bottle is empty it can be used as a handy laboratory dispenser or wash bottle for any chemical reagents in the laboratory, since polyethylene resists all chemicals including hydrofluoric acid at room temperatures. Space is provided on the label for indicating new contents.

• The *potassium salts of rhodizonic acid and tetrahydroxyquinone* are now being offered by Jasons Drug Co., 1085 Myrtle Ave., Brooklyn 6, N. Y. Both reagents have been found useful in sulfate determinations. The sulfate is precipitated with barium and the endpoint discerned by formation of the barium salts of the reagents. The orange-red color of the barium salt is greatly different from the original yellow.

Many other metal ions, such as copper, silver, mercury, lead and cadmium also give characteristic color reactions with dipotassium rhodizonate.

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*Everything you want*

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... in service*

- High Purity
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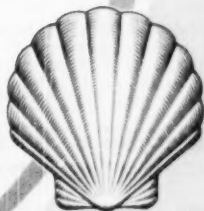
Whatever combination of advantages you require in Acetone . . . purity, absence of color, pleasing odor, or prompt deliveries in quantities to meet your production schedules . . . you'll find them all in Shell Acetone.

Long known for its value as a chemical intermediate and for its powerful solvency for a wide variety of materials, Shell Acetone steadily gains new applications.

Your Shell Chemical Representative can give you advice based on many years' experience with Acetone problems. Call on him at any time.

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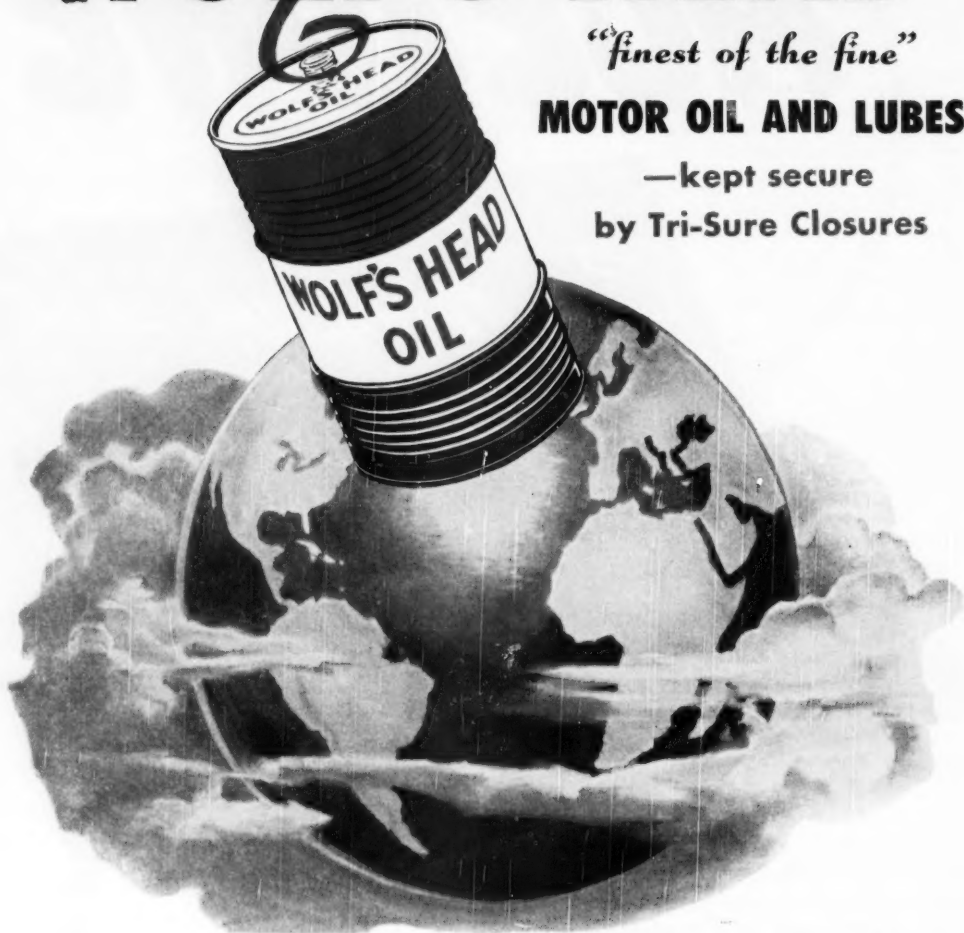
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\*\*From a letter written by the Wolf's Head Oil Refining Co., Oil City, Pa. This statement exemplifies the experience of America's leading drum users—and why they specify "Tri-Sure Closures" when they order drums.

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TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

# NEWS OF THE MONTH

## New Construction

- **Commercial Solvents Corp.** will increase its antibiotic production facilities with a new plant at Terre Haute, Ind. Located near the company's penicillin plant, the new unit will consist of a fermentation and filtration unit with all necessary equipment for large-scale production. Cost is estimated at \$670,000.

- **Production has begun** at Chas. Pfizer & Co.'s new synthetic organic chemical plant at its Groton, Conn., works. Products are synthetic caffeine, theophylline, acetophenetidin and similar compounds for drug manufacture.

- **Natural Products Refining Co.**, Jersey City, has just built a new office building at that location.

- **The Atomic Energy Commission** has selected the Bechtel Corp., San Francisco, Calif., to do the major construction work on the first reactor to be built at the Commission's new Nuclear Reactor Testing Station near Arco, Idaho. Work is beginning immediately and is expected to be completed by the end of the year.

- **Large-scale potash operations** at Carlsbad, N. M., are planned by Duval Texas Sulphur Co. It has been exploring and conducting research at potash leases in that area and recently decided to proceed with development work on an important scale.

- **American Optical Co.'s** new research laboratory in Stamford, Conn., was opened recently and the new facilities were inspected by the company's executive committee and by a group of industrialists from the Stamford area.

## Ownership Changes

- **Olin Industries, Inc.**, which was just licensed by Du Pont to make cellophane, has purchased the Ecusta Paper Corp., Pisgah Forest, N. C., to launch itself in the cellophane industry by using facilities at that plant initially. Olin Industries figures that this move will advance four to six months the date of its first manufacture of cellophane. This decision doesn't rule out other plant sites if the company decides to expand further in cellophane, and it is continuing to study plant location data supplied by Du Pont.

- **General Motors** has agreed to sell its interests in Kinetic Chemicals, Inc. (49% of the stock) to joint-owner E. I. du Pont de Nemours & Co. (51% of

the stock). Sale price is reportedly in the neighborhood of \$9.7 million. Before the deal can become final, however, the Securities & Exchange Commission must give its o.k.

Kinetic Chemicals manufactures Freon fluorinated hydrocarbon refrigerants and aerosol propellants at Deepwater, N. J., and East Chicago, Ill.



*H. V. Churchill (left), chief of the analytical chemistry division of Aluminum Co. of America's research laboratories at New Kensington, Pa., who was awarded the 1949 Pittsburgh Award of the American Chemical Society's Pittsburgh Section for achievements in analytical techniques for aluminum; and B. Bynum Turner, appointed general manager of manufacturing in charge of Ethyl Corp.'s activities in Baton Rouge, La. Mr. Turner succeeds John H. Schaefer, vice-president and director, who returns to the New York office to direct all manufacturing operations.*

- **The U. S. Testing Co., Inc.**, Hoboken, N. J., and the Esselen Research Corp., Boston, Mass., have merged, the latter becoming the Esselen Research Division of the former. It will continue operations in Boston.

The Esselen organization's services include new product development, product improvement, technical advice on patent and legal matters and economic surveys; U. S. Testing is one of the country's oldest and largest testing organizations.

- **The thermometer business** of the American Thermometer Company, St. Louis, Mo., has been purchased by the H-B Instrument Company, of Philadelphia, Pa., and all facilities at St. Louis have been transferred to Philadelphia.

## Washington

- **An Industrial Employment Review Board** to pass on appeals from decisions which denied to military contractors or their employees access to classified military information has been established by the Department of Defense. Consisting of four members—a

chairman designated by the Munitions Board, and one member each to be designated by the Secretaries of the Army, Navy, and Air Force—it will take over the function of the review board which has been operated in the office of the Provost Marshal General of the Army. It may establish area or regional boards.

- **Need for immediate research** in the whole field of air pollution was one of the most significant conclusions in the study issued by the Federal Security Agency on the Donora, Pa., smog disaster in which 20 people lost their lives. The conclusions of the exhaustive investigations carried on suggest the probability that a number of chemicals acting in combination or simultaneously caused the fatal illnesses, and point to a great deal of additional observation and research that must be made in industrial areas. The Public Health Service is now readying plans for an extended program in this field of air pollution.

- **The Munitions Board** has placed primary aluminum pig metal on the list of strategic and critical materials to be purchased for the national stockpile. Bauxite has been on the stockpile list for some time.

- **Two hundred and forty-seven** additional U. S. government-owned patent applications have been made available for foreign filing by the Office of Technical Services. Domestic licenses on the patent applications listed are not available, however. Sole purpose of the current list is to furnish U. S. manufacturers with an opportunity to contribute funds toward filing foreign applications in the Government's name. Foreign patents secured will eventually be licensed to American firms on a royalty-free, non-exclusive basis.

- **Construction of a petrochemicals plant** at Grangemouth, Scotland, to make ethyl and isopropyl alcohol for Great Britain's plastics and rayon industries has been approved as an industrial recovery project by the Economic Cooperation Administration. The alcohol plants are the first part of a three-stage construction program in this British Petroleum Chemicals, Ltd., project.

This first stage will cost the equivalent of \$17 million, including \$6.5 million in ECA funds to cover engineering fees and services and purchase of special equipment in the U. S. The remainder of the sum to match the ECA

fund will be furnished by Distillers Co., Ltd., and the Anglo-Iranian Co., Ltd., joint owners.

### Foreign Developments

• A Dutch artificial silk factory has acquired patents for making nylon and nylon manufactures from the Du Pont Co., according to the Netherlands Economic Bulletin.

• Reichhold Chemicals, Inc., has formed a Canadian affiliate, Reichhold Chemicals (Canada), Limited, Toronto, which has purchased from stockholders of American Alkyd Industries, Carlstadt, N. J., the unfinished resin manufacturing plant of Canadian Alkyd Industries, Limited, at Weston, a Toronto suburb. The plant will be equipped immediately to manufacture a complete line of synthetic resins.

• The British government is sponsoring a new system of export credit guarantees, designed to assist their manufacturers in entering the North American market. An export credit guarantee department has been organized to protect small exporters against loss on goods sold in the U. S. A. and to guarantee losses arising from market research surveys, advertising, etc.

### General

• Chemicals is one of the divisions of industrial supplies and equipment to be featured at the first U. S. International Trade Fair, Chicago, August 7-19, 1950. The fair is being given as a civic event and conducted on a non-profit basis by private industry.

• The School of Public Health, University of Michigan, is offering its first in-service training course in air pollution February 6-8, 1950. Industrial chemists and engineers as well as the more obviously interested groups will find their problems dealt with in the subjects to be covered.

• Twelve leading authorities on fire protection, prevention and control have accepted appointment to the board of counsellors for the Fire Technology Division of Southwest Research Institute of Houston and San Antonio.

### Company Notes

• The Chemical Division of Koppers Co., Inc., is leaving the cellulose field in order to devote all its plastic-manufacturing facilities to its rapidly expanding polystyrene business.



Barclay K. Read (left) who has resumed duties of assistant sales manager of the eastern division of Shell Chemical Corp. after two years in the management of western division sales; and Max Christensen, appointed supervisor of plastic sales for the Chicago territory of The Dow Chemical Co.

• The suit filed against Celanese Corp. of America by the Antitrust Division of the Dept. of Justice has occasioned the company to claim that the suit is based on the fact that Celanese acquired, by statutory merger, the Tubize Rayon Corp. Such action, says Celanese, enabled it to produce viscose rayon, in addition to its own acetate rayon, thereby putting itself competitively in the class with DuPont and American Viscose, which produce both types of rayon.

• The Du Pont Co. has listed an additional 730 of its patents on the U. S. Patent Office Register as available for licensing. Together with those listed last year, this makes a total of nearly 5,000 patents Du Pont has registered.

• Joseph J. Schaefer, chemical consultant, has established an office at 50 E. 41st St., N. Y. C.

• The Wheelco Instruments Co., Chicago, Ill., has recently signed a licensing agreement with a French instrument manufacturer, La Pyrometrie Industrielle, Paris, to make two of its instruments and to distribute them in France, Spain and Portugal.

• Rohm & Haas Co., following its policy of turning the greater share of its earnings back into new product development, plant expansion and research, recently declared a 4% stock dividend, instead of increasing the regular quarterly cash dividend of 25 cents on the common stock.

• Net income of American Potash & Chemical Corp. for the first nine months of 1949 amounted to \$1,169,847, compared with \$1,177,560 for the same period in 1948.

• Michigan Chemical Corp. and the Philip J. Lo Bue Co. have consolidated their offices at Michigan's N. Y. headquarters, 230 Park Ave.

• Chas. L. Huisking & Co., Inc., N. Y. C., this month marks its fortieth anniversary.

• A partial reorganization plan in National Aluminate Corp., Chicago, has

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**Other Names** ..... Sodium Sulphydrate, Sulphydrate of Soda.

**Formula** ..... NaSH (in aqueous solution).

**Properties** ..... An alkaline solution that smells of hydrogen sulphide. Weighs approx. eleven pounds per gallon at 60° F. The 45% solution "freezes" at 63° F., therefore shipment is made in tank cars equipped with steam coils.

SODIUM HYDROSULPHIDE SOLUTION is only mildly corrosive to carbon steel and cast iron, but alternate exposure to the solution and air should be avoided. Stainless steels (18-8) are highly resistant. Copper and its alloys, and aluminum and zinc are rapidly attacked.

These solutions are corrosive to the skin; rubber gloves should be worn. The fumes can be harmful.

**Grades** ..... Technical solutions containing from 45% to 50% NaHS.

<b>Analysis (Typical)</b> .....	Specific Gravity @ 15.6° C. (60° F.) .....	1.328
	Total Sulphide Sulphur as NaHS .....	47.80%
	NaHS .....	46.90%
	Na <sub>2</sub> S .....	1.25%
	Na <sub>2</sub> CO <sub>3</sub> , less than .....	0.10%

**Principal Uses** ..... Sodium Hydrosulphide Solution is an economical form of reactive sulphur in alkaline solution. It is used as a reagent in the manufacture of viscose. It is also a process material in the manufacture of some dyes, and is used in applying "sulphur dyes" to cotton, and to leather and skins. When used with lime, it is a useful dehairing agent for producing fine leathers.

**Packing** ..... In Tank Cars, 8,000 and 10,000 gals.  
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resulted in the formation of the Catalyst Division. Gage Averill has joined National Aluminate to serve as sales manager for the new division.

- **The Dow Chemical Co.** has opened a new sales office at 161 Spring St., Atlanta, Ga. The new Southeastern office will serve Ga., N. C., S. C., Ala., and Fla.

- **The Chemical & Process Machinery Corp., N. Y. C.**, has appointed E. Grimm & Co., Ltd., Managua, Nicaragua, as its representative in that country.

- **The Electro Chemical Supply & Engineering Co.**, has appointed the H. D. Fowler Co., Inc., of Seattle, as agent in the Northwest.

- **Faesly & Besthoff, Inc.**, chemicals, has moved from 220 E. 42nd St., to 325 Spring St., N. Y. C.

- **Officials of General Aniline & Film Corp.** and the General Aniline Employees' Organization, Inc., have signed the 1949-50 labor contract, covering approximately 1500 employees of the company's Grasselli, N. J., works.

- **Phillips Chemical Co.'s Cetus Plant**, near Etter, Tex., passed its millionth man-hour without a lost-time accident, at 12 noon, Nov. 18. This rec-

ord was established over a period of 391 calendar days, the last lost-time accident having occurred on Oct. 22, 1948.

## CALENDAR of EVENTS

**AMERICAN DRUG MANUFACTURERS ASSOCIATION**, Boca Raton Club, Boca Raton, Fla., March 27-30.

**AMERICAN INSTITUTE OF CHEMICAL ENGINEERS**, regional meeting, Houston, Texas, Feb. 26-March 1.

**AMERICAN MANAGEMENT ASSOCIATION**, St. Francis Hotel, San Francisco, Jan. 18-20.

**AMERICAN SOCIETY FOR TESTING MATERIALS**, William Penn Hotel, Pittsburgh, Pa., Feb. 27-March 2.

**ASSOCIATION OF SOAP AND GLYCERINE PRODUCERS**, annual convention, Hotel Plaza, New York City, Jan. 25-26.

**CHEMICAL MARKET RESEARCH ASSOCIATION**, Statler Hotel, Detroit, Feb. 2.

**COMPRESSED GAS ASSOCIATION**, Waldorf-Astoria Hotel, New York City, Jan. 23-24.

**DRUG, CHEMICAL AND ALLIED TRADES SECTION**, New York Board of Trade, annual dinner, Waldorf-Astoria Hotel, New York City, March 9.

**NATIONAL PLASTICS EXPOSITION**, Navy Pier, Chicago, March 28-31.

## PERSONNEL

### Company Officers

- **H. E. Bramston-Cook** has been elected a vice-president of **Oronite Chemical Co.**, a Standard Oil Co. of

California subsidiary. He will continue as Oronite's general manager of sales and product development work east of the Rockies, a position he has held for the past two years.

- **Vannevar Bush** has been elected a director of **Merck & Co., Inc.** Dr. Bush is President of the Carnegie Institution of Washington, D. C.

- **A. F. Kitchel** has been elected president of the **W. C. Hardesty Co.** He was formerly vice president and chairman of the board of directors.



**Frederick E. Frey (left)**, chosen to receive the 1949 Southwest Regional Award of the American Chemical Society; and **Karl J. Brunings**, appointed assistant director of chemical research and development for **Chas. Pfizer & Co., Inc.** Dr. Frey, assistant director of research of **Phillips Petroleum Co.**, is cited for major contributions in the field of petroleum chemistry.

- **Morse G. Dial** has been elected a director, and **Kenneth H. Hannan** elected secretary of **Union Carbide and Carbon Corp.**

### Production

- **American Maize-Products Co.** has appointed **Earle E. Langeland** as plant manager. He will be responsible for the administration and direction of all activities at the Roby plant.

- **Charles A. Lambert**, manager of the Hattiesburg, Miss., naval stores plant of **Hercules Powder Co.**, retired December 31. **L. Coleman Hall**, formerly plant superintendent, succeeds him as plant manager.

### Sales

- **Eugene F. Allen**, formerly associated with **Royal River Chemical Co.** and **Tennessee Products and Chemical Corp.** in sales capacities, has been appointed assistant to the manager of the chemical division of **McKesson & Robbins, Inc.**

- **The Mallinckrodt Chemical Works** has appointed **Walter S. Keutzer** as assistant sales manager, Western Division, headquarters in St. Louis, Missouri.

### Research

- **Louis Koenig** has been named assistant director of research at **Stanford Research Institute**. He was previously with the **Armour Research Foundation** of **Illinois Institute of Technology**.

- **Wendell P. Metzner** has been appointed research director for the Rubber Service Department of **Monsanto Chemical Co.'s Organic Chemicals Division**. He has been associate director of research for the Rubber Service Department since September, 1947.

## Notes on Our Management

WE do not think of Management as the head, heart or a separate section of our organization body. It is an indivisible life-stream that runs through the entire endeavor—intimately working with and nurturing the farthest flung element—concerned with the youngest representative on the road, the smallest customer and the lowliest employee. Its one aim—quality of product and good service.

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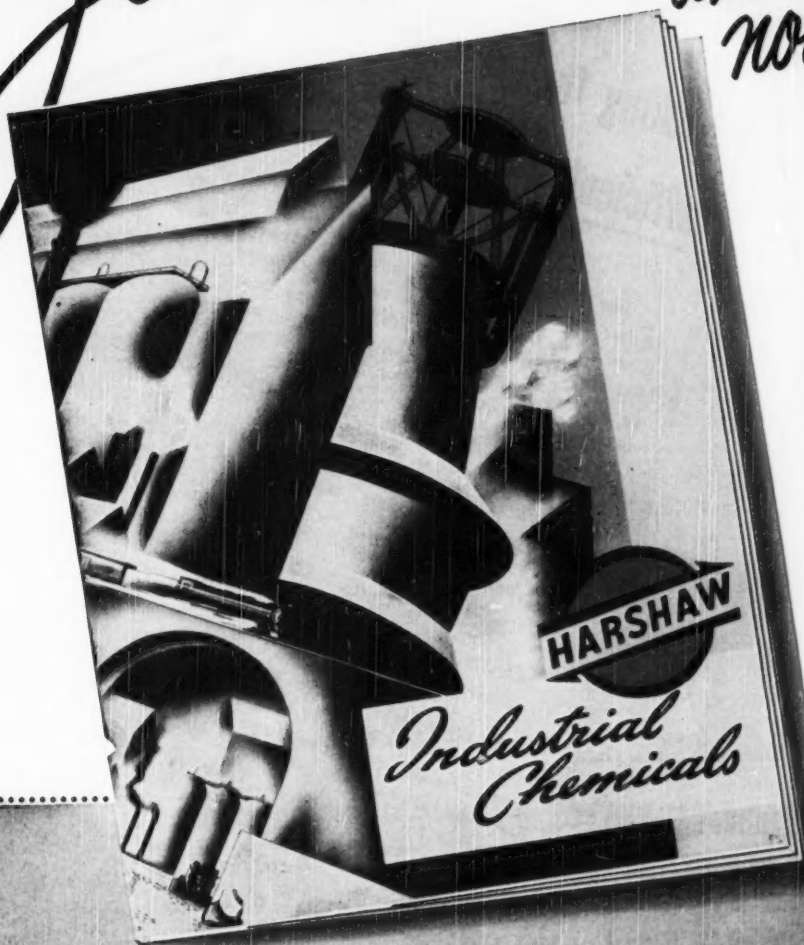
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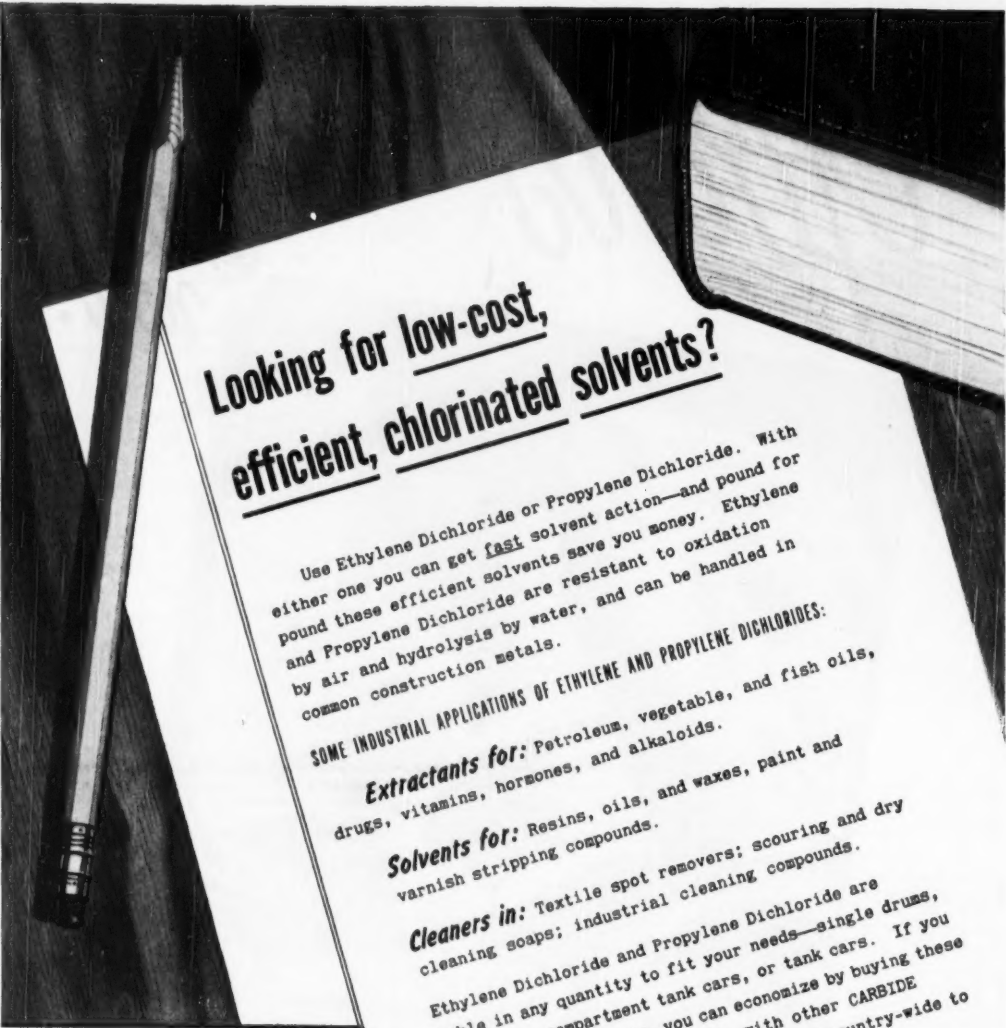
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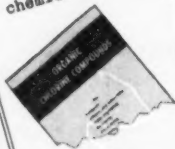
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**Plasticizer, C101.** 8-p. bulletin describes properties, compatibility and uses of Paraplex G-60, a polymeric type plasticizer. Rohm and Haas Co.

**Alkali Chemicals, C102.** 16-p. booklet describes 8 major groups of alkali chemicals, their derivative specialized materials and their co-products, and their uses throughout industry. Diamond Alkali Co.

**Divinylbenzene, C103.** Technical data bulletin describes properties, inhibitors, antioxidants and handling precautions for divinylbenzene. Bromate-bromide and mercuric-acetate titration procedures for vinyl group determination are discussed. Dow Chemical Co.

**Plasticizer, C104.** 4-p. bulletin describes specifications, properties, uses and gives test data on KP-140 plasticizer (tri-butylphosphite). Bulletin No. NL-1-49, Ohio-Apex, Inc.

**Carbon Blacks, C105.** 85-p. booklet gives particle size data and shows electron micrographs for all Cabot carbon blacks. Procedure for determining particle size with electron microscope explained. Godfrey L. Cabot, Inc.

**Surface Active Agents, C106.** 11-p. bulletin describes physical and chemical properties and gives formulations for Areskap (mononutyl phenylphenol sodium monosulfonate), Areskap (mononutyl biphenyl sodium monosulfonate), and Areskap (divutyl phenylphenol sodium disulfonate). Bulletin No. F-113, Monsanto Chemical Co.

**Sugar Derivatives, C107.** 35-p. booklet presents a tabular form sugar derivatives which are potentially capable of being produced at a material cost of less than \$1.00 per pound. Brief resume of how each derivative is prepared included. Technological Report Series No. 6, Sugar Research Foundation, Inc.

**Resins for Surface Coatings, C108.** Booklet tabulates physical and chemical properties of each of the coating resins made by American Cyanamid Co.

**Coating, C109.** Bulletin describes advantages, specifications and application of a speed black white synthetic enamel. Monsanto Chemical Co.

**Resin Glues, C110.** 45-p. booklet discusses techniques, uses, instructions and technical data on Plaskon glues. Plaskon Division, Libbey-Owens-Ford Glass Co.

**Acid Inhibitor, C111.** 4-p. bulletin describes function and use of Hibitite acid inhibitor and contains detailed instructions for inhibiting sulphuric, muretic and phosphoric acids with Hibitite for pickling steels, removing metal coatings, cleaning equipment and for the protection of iron and steel. Monsanto Chemical Co.

**Fine Organic Chemicals, C112.** 23-p. bulletin lists prices of chemicals available from The Matheson Co.

**Cements, C113.** Chart shows resistance of tris and silicate cements to various corrosive chemicals. Special Chemicals Dept., Pennsylvania Salt Mfg. Co.

**Carbon Black, C114.** 4-p. bulletin lists properties and uses of various carbon blacks. Godfrey L. Cabot, Inc.

**Molding Compounds, C115.** 12-p. bulletin describes properties, applications and mobility of Plaskon urea and melamine formaldehyde molding compounds. Plaskon Division, Libbey-Owens-Ford Glass Co.

**Chemical Intermediates, C116.** Catalog lists 270 I. G. Farben manufacturing processes for chemical intermediates used in the production of dyes, textile auxiliaries, pharmaceuticals and other specialties, color bases and synthetic tanning agents. Prices included. Re-

search Bulletin No. 40, Research Information Service.

**Patents Available, C117.\*** 6-p. bulletin lists Northern Laboratory patents available for royalty-free licensing, and information on procedure for obtaining licenses. Northern Regional Research Laboratory, U. S. Dept. of Agriculture.

**Coating, C118.** 4-p. bulletin describes advantages and applications of Duridine for cleaning and protecting metal surfaces. American Chemical Paint Co.

**Molding Compound, C119.** 4-p. bulletin describes properties, molding characteristics and technical data on Plaskon alkyl molding compound. Plaskon Div., Libbey-Owens-Ford Glass Co.

## Equipment

**High Vacuum Apparatus, K100.** 48-p. bulletin describes, illustrates and gives specifications for vacuum pumps and accessories. Bulletin No. 10A, Central Scientific Co.

**Smoke Density Indicator, K101.** Bulletin PE 4710 describes smoke density indicator. Photoswitch, Inc.

**Clamps, K102.** 5-p. bulletin describes principles, characteristics and applications of Negator clamps. Bulletin No. 310-10, Hunter Spring Co.

**Safety Equipment, K103.** 64-p. catalog describes eye and respiratory equipment and gives technical and reference material for the selection of the proper type of material for specific hazards. Charts show comparative features of various styles. Wilson Products, Inc.

**Valves, K104.** 4-p. bulletin contains dimensions, weights, prices and operating data for meter, gate, instrument and other valves. Bulletin No. 491, Edward Valves, Inc.

**Flame Failure Safeguard, K105.** Bulletin CD 4751 describes fireproof programming control. Combustion Control Corp.

**Humidity, Temperature and Pressure Instruments, K106.** 4-p. bulletin describes advantages and specifications of instruments for recording relative humidity, temperature and pressure. The Emil Greiner Co.

**Glassware, K107.** Bulletin B-53 describes properties of various general purpose glasses, electrical glasses, and glass used for chemical application. Tables and charts included. 14 pp. Bulletin B-54 discusses methods of manufac-

ture and designs of commercial glassware. Corning Glass Works.

**Coal Preparation, K108.** 20-p. bulletin describes design, engineering and construction of equipment for preparing coal. Bulletin No. 173, Roberts and Schaefer Co.

**Clutches, K109.** 12-p. bulletin describes, diagrams and gives specifications of gear tooth and pin drive disc clutches. Bulletin SF-3, The Edgemon Machine Co.

**Desaerating Heaters, K110.** 8-p. bulletin describes design, operation and application of desaerating heaters. Diagrams included. Graver Water Conditioning Co.

**Casters, K111.** Catalog supplement lists specifications and capacities of Series 40 "cold-forged" casters. Form Series 40, The Hagada-Standard Co.

**Gas Truics, K112.** 4-p. folder gives instructions on how to operate gas trucks safely and with a minimum of wear. Bulletin F1170, The Yale & Towne Manufacturing Co.

**Oil Burners, K113.** 24-p. catalog describes advantages and operation and diagrams oil burner for heat processing in metallurgical, ceramic, glass, chemical and paving material plants, etc. Isaac Manufacturing Co.

**Heaters, K114.** Catalogs EC-64 and EC-61 describe and give specifications for electric heaters. Typical installations shown. Electromods Corp.

**Valves, K115.** 16-p. bulletin describes principle of operation and engineering data on complete line of Venturi-Ball valves. Bulletin No. 103, Paul Valve Corp.

**Spray Nozzles, K116.** 4-p. bulletin describes industrial spray nozzles. Table on capacities, spray angles, orifice diameters and pipe sizes included. Bulletin No. 20, Sinks Mfg. Co.

**Metalurgical Chemistry and Testing, K117.** 4-p. bulletin describes services of Lucius Filkins, Inc.

**Litmus Papers, K118.** 4-p. bulletin lists prices of litmus papers available from American Indicator-Paper Co.

**Cartesian Manostat, K118a.** Bulletin CM 97 describes new cartesian manostat. The Emil Greiner Co.

**Maintenance Control, K119.** 6-p. folder describes advantages and use of Karox visible maintenance control systems. Remington Rand.

**Valve, K119a.** 6-p. bulletin contains operation and construction features of air valve for control of air cylinder action. Beckett-Harsco Co.

**Seat Ring Wrenches, K120.** 8-p. folder describes

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C104	C114	K104	K114	K122	K132	K142	K152	K163	K174
C105	C115	K105	K115	K123	K133	K143	K153	K164	K175
C106	C116	K106	K116	K124	K134	K144	K154	K165	K176
C107	C117*	K107	K117	K125	K135	K145	K155	K166	K177
C108	C118	K108	K118	K126	K136	K146	K156	K167	K178
C109	C119	K109	K119a	K127	K137	K147	K157	K168	K179*
							K158	K169	K180

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and lists prices for steel seat ring wrenches. Lunkenheimer Co.

**Fluid Drives, K121.** 26-p. catalog describes types, sizes, construction features, arrangement and dimensions of fluid drives. Section tables included. Book No. 2485, Link-Belt Co. **Water Softener and Logwasher, K122.** 14-p. bulletin describes advantages, operation and application of unit process slurry type precipitating water softener and logwasher. Diagrams included. Bulletin W-216-80, Worthington Pump and Machinery Corp.

**Materials Handling, K123.** 10-p. booklet describes 14 essential types of equipment for positioning materials in production processes. By George L. Raymond and William L. House, Lyon-Raymond Corp.

**Spectrometers, K124.** 8-p. bulletin covers application of various ratio mass spectrometers to use and measurement of static free isotopes. Data on operation, features, characteristics and diagrams included. Consolidated Engineering Corp.

**Centrifugal pumps, K125.** 12-p. booklet describes installation and operation of centrifugal pumps in corrosive service. Bulletin 8124, ABE Hurtron Co.

**Ortascop spectrograph, K126.** 4-p. reprint entitled "Ortascop Spectroscopy with the Orton Spectrograph" by J. J. Agnew, M. G. Franklin, R. E. Benn and A. Macarion available from the Franklin Institute for Research and Development.

**Furnace meters, K127.** 2-p. bulletin gives advantages, capacities and dimensions for furnace meter for measurement of gas flow rates. Fischer & Porter Co.

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**Strainers, K130.** 4-p. bulletin describes advantages, types, sizes, pressures and ratings of pipeline strainers. Bulletin S-202, Yarnall-Waring Co.

**Mills, K131.** 4 bulletins describe and give specifications and dimensions of roll and colloid mills. 4 pp. each, Troy Engine and Machine Co.

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**Pumps, K138.** 4-p. bulletin describes briefly and

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**Fork Trucks, K141.** 16-p. bulletin describes complete line of Lewis-Shepard "Spacemaster" electric fork trucks with specifications and dimensional drawings. Bulletin No. 23, Lewis-Shepard Products Inc.

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**Air Diffuser, K145.** 4-p. bulletin describes features and application of type E aspirating air diffuser. Dimensional data included. Bulletin No. 29, Anemostat Corp.

**Flanges and Gaskets, K146.** 4-p. bulletin describes advantages and uses of Clitank flanges and flange cutters. American Pipe and Steel Corp.

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**Materials Handling, K153.** Booklet describes all Aerial products and how they solve particular materials handling problems. Dimensions, load ratings, and code numbers tabulated. Aerial Co., Inc.

**Adjustable Speed Drives, K154.** 5 booklets describe adjustable speed drives. GEA-5334, 24 pp., discusses selection of adjustable speed and application and performance of various packaged units. GEA-4883A, GEA-5335, GEA-5336, and GEA-5337 describe use, advantages, operating characteristics and ratings of adjustable speed A.C. motors, speed variator, electronic speed variator, and Thy-Mo-Trol adjustable speed drives. General Electric Co.

**Pumps, K155.** 15-p. bulletin describes application, construction, and operation of Type G vertical, self-priming, centrifugal pump. Diagram included. Bulletin No. 53, The Labour Co., Inc.

**Filters, K156.** 24-p. bulletin describes principles of continuous rotary vacuum filtration, and

general construction specifications. Typical installation diagrams shown. Filtration Engineers, Inc.

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**Safety, K160.** 14-p. booklet describes how to set up and conduct an eye safety program. American Optical Co.

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**Cooling Towers, K162.** 4-p. bulletin describes application, operation, and installations of Type E induced draft cooling towers. Cooling tower and pump selection table included. Binks Mfg. Co.

**Filters, K163.** 6 bulletins describe advantages and operation of continuous disc type filter, horizontal rotary filter, vacuum filter, lime mud filter, dewater filter, and pressure filter. Bulletin Nos. 600, 218, 701, 216, 217, 113. Oliver United Filters Inc.

**Combustion Controllers, K164.** 12-p. bulletin describes uses, design and construction, operating principle, capacities and selection procedure for combustion controllers. Selas Corp. of America.

**Strain Gages, K165.** 8-p. bulletin describes procedures for attaching BK-4 resistance wire strain gages to surfaces. The Baldwin Locomotive Works.

**Pressure Vessel Accessories, K166.** 64-p. Catalog 1-72 contains engineering data and specification details on welding necks, nozzles, rings, studing outlets, saddies and other pressure vessel accessories. Lenape Hydraulic Pressing and Forging Co.

**Carbon Dioxide Regulators, K167.** 12-p. booklet includes regulator selector guide, features of single-stage and two-stage regulators and operating hints. Catalog ADCF-16, Pure Carbonic, Inc.

**Timer, K168.** 4-p. bulletin describes engineering features, specifications and prices of impulse timer for production line control, pilot circuit, laboratory testing, etc. Acuth Electric Co.

**Insulating, K169.** 8-p. bulletin describes uses, characteristics and specifications of self-lubricating, cushioning made of Graphalloy. Graphite Metallurgical Corp.

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**Elevating Positioners, K175.** 4-p. bulletin describes advantages and installation of 3 basic types of elevating positioners. Bulletin No. 440, Lyon-Raymond Corp.

**Gages, K176.** 12-p. bulletin tells how to select and use SR-4 bonded resistance wire strain gages in stress analysis. Bulletin 279-A, The Baldwin Locomotive Works.

**Stainless Steel Hardening, K177.** 24-p. booklet describes method and advantages of Super Scottizing for hardening stainless steel. C. U. Scott and Sons, Inc.

**Miscellaneous**

**Chlorine Dioxide Safeguards, K178.** 24-p. booklet describes precautionary fire and explosion safeguards in the use of chlorine dioxide for industrial bleaching. Information on chlorine dioxide generators, properties of chlorine dioxide and sodium chloride and fire and explosion experiences included. National Board of Fire Underwriters.

**American Cyanamid Co., K179.** 64-p. booklet describes products and services of the American Cyanamid Co. for industry and agriculture.

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Odor	Mild, characteristic
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Saponification Number	364-374
Containers	50-55 gal. non-returnable steel barrels.

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Odor	Mild, characteristic
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## CHEMICAL MARKETS

### Chlorine Shortage Persists

Although chlorine continues to break its all-time production records, it still remains the outstanding exception among chemical commodities in that there is still a shortage. The summer months with their demand for chlorine for sanitation and algae treatment were marked with a tight position in cylinders, but growing markets for this chemical is the fundamental cause of supply failing to meet demand.

At the end of the war, the manufacturing capacity of the country had more than doubled that of 1939, and there was a fear that peace-time demand would not absorb this increase. Since then, the peak tonnage attained during the war has been exceeded, yet these early postwar fears have not been substantiated. In fact, since 1946 the installed producing capacity has increased approximately 20 per cent, and a further sizable increase is to be ready by May 1, 1950. Still the country is experiencing tight supplies. There have been minor cutbacks in production, as a result of economic disturbances, but even in the face of full production, supplies have not been easy.

Production of chlorine gas for September 1949 was 147,214 short tons, as compared with August 1949 production of 147,825 short tons, and September 1948 production of 136,328 short tons.

### Inorganics Levels Higher

Domestic monthly production levels of industrially important inorganic chemicals for September generally were slightly

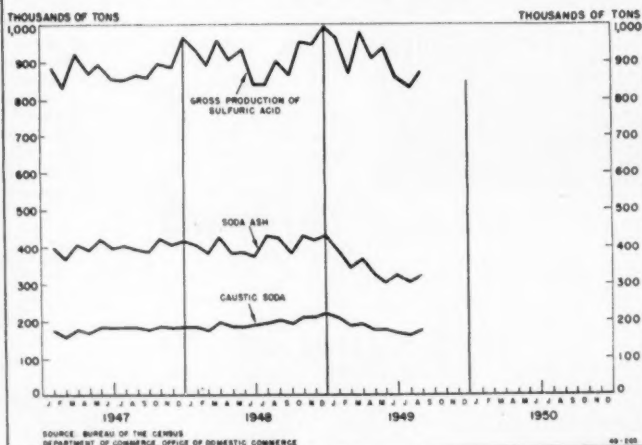
higher than those of the previous month and of the corresponding month of 1948, according to the Bureau of the Census, Department of Commerce. Increases above August 1949 quantities were reported for 18 of the 35 chemicals included in the Bureau's continuous monthly survey, while decreases were reported for 13. Sixteen of the 35 chemicals were produced in larger volume during September 1949 than in September 1948.

Of the "heavy volume" chemicals, ammonium nitrate, ammonium sulfate, caustic soda and hydrochloric, nitric and phosphoric acids were all produced in greater quantities than in August 1949 or September 1948. The 317,406 short tons of liquid soda ash produced in September represent a 4 per cent increase when compared with the previous month's output. Gains were also reported for the sodium phosphate compounds and silver nitrate. Declines of 7 per cent or less occurred in the production of synthetic anhydrous ammonia, calcium carbide, and hydrofluoric and sulfuric acids.

### Naval Stores Dull After Support Drop

The announcement of the Government's support price for the naval stores industry at 60% of parity in contrast to the 80% of parity that prevailed in 1949 has resulted in a deadening of the rosin market. This cut in the loan value of the 1950 crop is being hotly protested by the industry, with the hope that it may be raised as it was last year when a figure of 70% was first announced, but later

PRODUCTION OF SULFURIC ACID AND ALKALIES



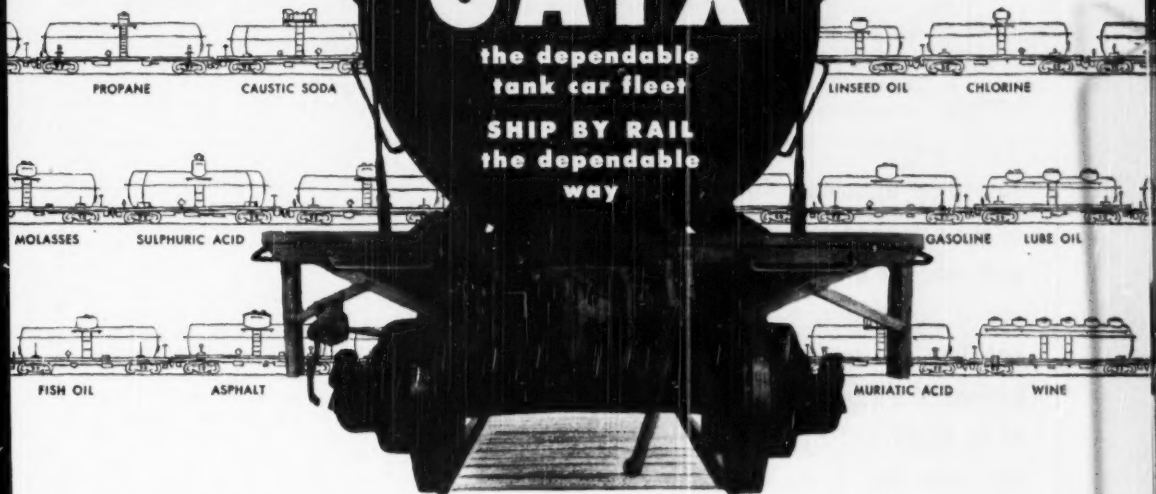
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revised to 80%. Since no one knows what rosin will be worth, everyone is sitting tight until it is determined whether there will be any change in the new support price. Turpentine, however, for which the base price is 40 cents, is not expected to be changed in price.

## Many Organics Registered Gains in September

With the exception of coal chemicals which were hard hit by strikes in the coal and steel industries, many organic chemicals showed gains in production for September 1949, according to a U. S. Tariff Commission preliminary report.

Increased production was reported for the following cyclic intermediates (August 1949 figures given in parenthesis; all figures in thousands of pounds): aniline, 5,458 (4,144); monochlorobenzene, 18,263 (14,684); refined naphthalene, 5,444 (4,276); phthalic anhydride, 12,602 (10,103). Decreases were reported for: acetanilid, 222 (286); cresylic acid, refined, 1,791 (1,963); phenol, 12,392 (13,968).

For the only cyclic crudes for which complete figures could be given, increases were registered by the following (August

1949 statistics in parenthesis; all figures in thousands): tar distillers benzene, 762 gallons (590); toluene, exclusive of coke-oven operators, 3,262 gallons (3,025); tar distillers naphthalene, 14,201 pounds (10,683). Tar distillers creosote oil decreased from 8,704 gallons in August to 8,352 gallons (both figures in thousands) in September.

Increases were registered by the following specified organic chemicals (all figures in thousands of pounds; August statistics in parenthesis): acetone, 29,450 (27,209); formaldehyde, 45,215 (43,452); synthetic acetic acid, 33,186 (29,957); acetic anhydride, 62,927 (50,786); ethyl ethers, 2,547 (2,232); carbon tetrachloride, 17,162 (16,814). Decreases: ethyl acetate, 85%, 5,339 (6,424); carbon disulfide, 26,643 (28,211).

Among specified alcohols and polyalcohols, synthetic methanol showed a substantial gain, with 61,911 pounds reported for September as against 53,513 (both in thousands of pounds) for August. The following declines were registered (statistics in thousands of pounds; August figures in parenthesis): butyl alcohol, 10,056 (10,128); ethylene glycol, 33,367 (38,013); natural methanol, 966 (1,043).

## Market Review

With both coal and steel strikes out of the way, chemical purchasers tried to replenish inventories of coal tar chemicals that had shrunken during the shutdown. In general, however, the year's end and the holiday season brought with them the characteristic seasonal slowness.

Benzene was still tight, and although the situation eased somewhat on phenol, styrene, cresol, cresylic acid, naphthalene, and phthalic anhydride, the squeeze was not yet entirely off. There were foreign arrivals of both naphthalene and phthalic, but demand was strong enough for their effect not to be felt to any degree. Toluene and xylene continued in the tight category. An important price increase was a 2¢ a gallon advance in benzene, toluene and xylene set for the first of the year.

Another strike that shut down three potash plants at Carlsbad, N. Mex., threatened to affect the fertilizer industry as well as other chemicals produced from potash. Significant changes were reductions in granular cyanamid from \$58.71 to a price of \$46.50 a ton, f.o.b. works, and in by-product ammoniacal liquor, which was cut \$5 to \$75 a ton. Calcium chloride was moving well, but anhydrous ammonia was reportedly on the long side.

Large imports of cresylic acid

were reflected in a reduction of 4¼-5¢ a pound in the plasticizer tricresyl phosphate. It was lowered to 29¢ a pound in tank cars, 30¼¢ in carlot drums, and 31¢ l.c.l., all prices east of the Mississippi.

Powdered synthetic camphor hit a ten-year low when the price was cut from 53¢ to 45¢ a pound in quantity. It was the result of low prices for the natural. Theobromine was reduced 50¢ a pound, to be followed by its salts with a 25¢-\$1 a pound reduction. Tartrates were reduced 1-3¢ a pound, establishing cream of tartar, NF, granular or powdered at 27¼¢, tartaric acid, USP, at 31¼¢, and Rochelle salts at 27¼¢. A slash of 25¢ carried streptomycin to an all-time low, with a single gram vial at 75¢.

A generally strong tone prevailed in essential oils, although lemongrass and citronella reversed this trend for a time, and some reductions were registered. The price on musk used as a fixative was advanced \$10 an ounce.

Among other price changes was a reduction in carbon bisulfide in tank cars by Stauffer Chemical Co. to \$4.45 per cwt., f.o.b. plant. Dextrine was raised 5¢ per cwt., and Diamond Alkali cut its chlorinated wax, Chlorowax 70, 15% to 15¼¢ a pound l.c.l., and 15¢ in carlots.

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Cowles DRYORTH, anhydrous sodium orthosilicate, is a powerful, speedy, heavy-duty cleaner with valuable penetrating and wetting-out properties, reinforced dirt-removing power and unusual emulsifying action. It is an anhydrous, free-flowing powdered silicate containing not less than 60%  $\text{Na}_2\text{O}$ , which may also be used as an economical constituent of high pH cleaning compounds.

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# INDUSTRY'S BOOKSHELF

## *Saga of a Great Industry*

AMERICAN CHEMICAL INDUSTRY: A HISTORY, by William Haynes. D. Van Nostrand Co., Inc., New York. 6 Vols. \$60. Reviewed by Robert L. Taylor, Editor.

EVERY great period of history has had its scribes and its chroniclers, those who put pen to paper to record the thoughts, the actions, the causes and effects of the times. It is upon the accumulated experiences of men so recorded that civilization has inched its weary way forward to make what we have come to know as progress.

But if a knowledge of past events and influences is important to the learning process in politics and social conduct, it is no less important to that same process in business and industry. Unfortunately business men and industrialists have been so engrossed in their immediate pursuits that they have seldom had either the time or the inclination to write about them. There are few good business histories in existence today. Members of the chemical industry may not yet know how fortunate they are to be in the process of acquiring one of the best.

### *The American Chemical Age*

William Haynes, who incidentally was editor and publisher of *CHEMICAL INDUSTRIES* from 1920 to 1939, has succeeded with the assistance and cooperation of numerous prominent individuals and companies in producing an exceedingly full and readable account of the dramatic growth of the American chemical industry.

Thus far four of the six volumes have come from the press. Vols. II and III cover the important World War I period: 1912-1922. Vol. IV covers those expansive and vigorous years that the author chooses to call The Merger Era: 1922-1929. Vol. VI is a collection of individual histories of 219 chemical companies prepared according to specifications set forth by Mr. Haynes. Vol. V, covering the post-1929 period, is due off the press in March of this year. Vol. I, chronologically the first of the series since it deals with the pre-1912 era, will be the last.

Though still young by many standards, the chemical industry in this country is not a new industry. Its roots are firmly planted among the commercial enterprises of earliest colonial days. Many who now make their livings at producing or selling chemicals will be surprised to know that by 1914, when World War I broke out,

we were making nearly as much sulfuric acid as Great Britain and Germany combined. Ten years later we were producing more than twice as much as these two, plus France, Belgium and Japan.

### *Bumps and Bruises*

But the early days were not without their heartaches, discouragements, and lessons learned the hard way. The almost futile efforts of Henry Howard, J. F. Schoellkopf, Jr., and others to get some consideration for the plight of chemical makers in the setting of rates on dyes under the Wilson Tariff of 1913 is a reminder that the ways of Washington have not changed over the past 36 years. Chairman Underwood of the House Ways and Means Committee, sponsor of the Tariff Act, affected to believe that the manufacture of dyes was simply a mixing process involving neither very great skill nor much labor. "Of course," he said, "chemical changes take place, but I am talking about a mechanical proposition as far as labor and time are concerned. After all, this appears to be just a matter of mixing them together."

The World War I period closed, however, with the passage of another and quite different tariff, the Fordney-McCumber Law of 1922, whose much-criticized, highly protective rates undoubtedly saved the lives of our war-born chemical industries.

In the post-war era up until the Great Depression, the chemical industry consolidated its war gains and laid the foundation of integration and technical knowledge that was to enable it to weather the shock of 1930 to 1933 in amazingly good fashion. It was during this period that the great diversification of the industry began to take place. New product research became a necessary part of company activities. Definite sales policies and methods began to take shape.

### *A Masterful Job*

Out of a welter of events, forces and trends Mr. Haynes has contrived to build a history that not only tells the story of a great industry and its development but also relates it to the economic, political, social and business tides of the nation as a whole—some affected by, as much as affecting, the growth of chemical manufacture.

Perhaps even more important, he has succeeded in making his narrative alive and real through a liberal use of names, pictures and personal references, many

of whom are still familiar personages in the industry today.

The potash rush of 1910 to 1914 carries some of the flavor of the Old West, when at least part of the chemical industry was still a prospector's game. Carl L. Modest's experiences in opening up the Nebraska potash lakes, which produced more potash during World War I than any other source, is enough to make any young chemical engineering graduate wish for the good old days.

Within the broad time periods covered by the individual volumes, related facts have been grouped together in order to achieve clarity and emphasis. Thus the time-sequence of events is not strictly followed. There is no doubt, however, that this practice adds to the value and interest of the work.

But if "American Industry" is interesting reading, it should also be authoritative. Mr. Haynes apparently has spared no effort to verify facts and figures. In addition to numerous references to the literature and personal communications at the end of each chapter, he has submitted each section for checking wherever possible to living persons closely connected with the events described.

Altogether it can be said without reservation that these six volumes will constitute an unparalleled contribution to American chemical literature. They should be on the required reading list of every chemical executive and executive-to-be. Chemical company and university libraries can hardly afford to be without a set, and they will find a place on the shelves of many private libraries as well.

## *Ion Exchange*

ION EXCHANGE, THEORY AND APPLICATION, edited by Frederick C. Nachod. Academic Press, Inc., New York, 1949; 411 pp., \$8.50. Reviewed by Robert Kunin, Resinous Products Division, Rohm & Haas Co.

THE WIDESPREAD utilization of ion exchange in industrial operations, laboratory studies, and in the home has created a considerable demand for a book covering the various aspects of this phenomenon. Dr. Nachod has assembled a team of seventeen contributors in an attempt to prepare a treatise covering both the theory and application of ion exchange. Although many of the contributors have done an excellent job in their treatments, the book on the whole suffers from a lack of continuity and is poorly organized—a common criticism of books prepared by a series of contributors.

Although the sixteen contributions contained in the book cover a considerable portion of the field of ion exchange, many important topics have been totally ignored. A treatise bearing the title, "Ion Exchange, Theory and Application," should be expected to cover the funda-

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### Crystal Structure

### Tetragonal

#### Bulk Density—

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184 lbs./cu. ft.

0.104 lbs./cu. in.

Milled Zircon

192 lbs./cu. ft.

0.109 lbs./cu. in.

Fired Rammed Body

215 lbs./cu. ft.

0.120 lbs./cu. in.

Fired Slip Cast Body

230 lbs./cu. ft.

0.129 lbs./cu. in.

#### Thermal Conductivity cal./cm./sec./cm.

50° to 700°F = 0.031 BTU/ft./hr./sq. in./°F

= 0.0258

#### Mean Specific Heat

(21-51°C) 0.135 cal./gram/°C

#### Softening Point

3495°F (1930°C)

#### Cold Modulus of Rupture

Rammed Body—1400-2400 psi

Slip Cast Body—2000-3000 psi

#### Melting Point

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1300° 70

1400° 30

1500° 7

1600° 2.5

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mental properties of inorganic exchangers as well as the organic resinous exchangers. It should also be expected to include the applications of ion exchange in soils, ceramics, geology, etc. With but a few exceptions, the book has been devoted primarily to ion-exchange resins. It is difficult to understand why separate chapters should have been devoted to topics of such minor importance as "Ion-Exchange Recovery of Alkaloids," "Desalting Sea Water" and "Multistage Systems in Ion Exchange" whereas no contributions were made at all on the methods and techniques used in studying the physical and chemical properties of ion-exchange substances.

In the introduction, the editor has classified ion exchange, distillation, adsorption, and filtration as unit processes whereas the literature, in general, refers to these phenomena as unit operations. Although there may be some excuse for classifying ion exchange as a unit process, the term unit operation must be designated if this phenomenon is to be included in a class with distillation, adsorption, and filtration.

Many of the contributions are well written and contain much useful information that will be of considerable interest to those interested in ion exchange. In particular, the chapters on equilibria, kinetics, ion-exchange resins, and inorganic separations are excellent contribu-

tions. Of considerable interest to those engaged in industrial applications will be the chapters on equipment design, water treatment, sugar refining, miscellaneous applications, and multistage systems. The chapters on metal concentration, analytical applications, catalysis, biochemical applications, and amino acid chromatography may also be of considerable interest to many. However, it is unfortunate that the contributors were unable to include many new developments of the past two years and it is hoped that a second edition will incorporate these.

The book is well bound and of good grade paper; however, the price of \$8.50 seems to be unjustified.

### Chemical Marketing

THE MARKETING OF CHEMICAL PRODUCTS, by R. S. Aries and William Copulsky. Overland Commercial Corp., 26 Court St., Brooklyn 2, N. Y., 150 pp., \$3. Reviewed by R. L. Taylor, Editor.

BOOKS on the marketing of chemicals are conspicuous by their absence. The subject is one that has found really serious study only in the last decade or two, and its literature has been confined to periodicals and occasional single chapters in volumes of wider scope.

The present book (now in its second printing) is a first step, and its authors are the first to admit, in their preface,

that it does not meet the need for a thorough treatment of the vast subject of chemical distribution. But Aries and Copulsky have assembled material that will give the novice a reasonably good idea of how chemicals are sold.

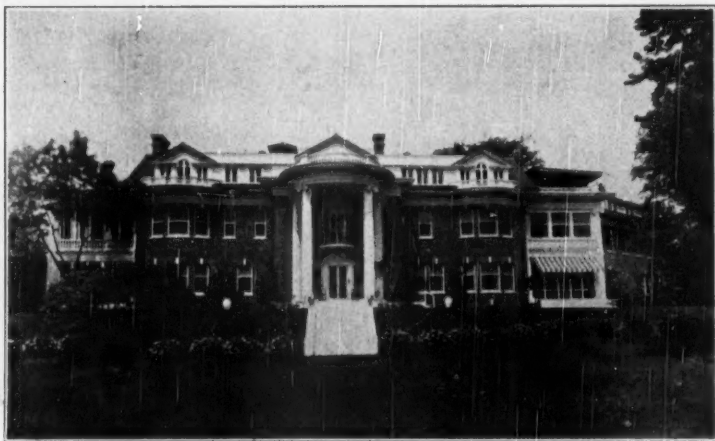
They cover such phases of the chemical marketing function as advertising, direct selling, market research, technical service, development of new products and new markets, and marketing to the consumer. A comprehensive bibliography is appended, which persons experienced in chemical marketing are likely to find the most useful part of the book. The volume is based on material used by the authors in their senior and advanced classes in chemical engineering economics at the Polytechnic Institute of Brooklyn.

### Biochemicals

BIOCHEMICAL PREPARATIONS, Vol. 1, Herbert E. Carter, Editor-in-chief. John Wiley and Sons, Inc., Chapman and Hall, Limited, \$2.50. Cloth bound, 6 x 9 1/4 inches, 76 pp., no illustrations, indexed. Reviewed by L. J. Teply, Enzyme Institute, University of Wisconsin.

THIS is the first volume of a series (one volume to be published every 12 to 16 months) which is intended to be to bio-chemistry what "Organic Syntheses" is to chemistry. Sixteen preparations of

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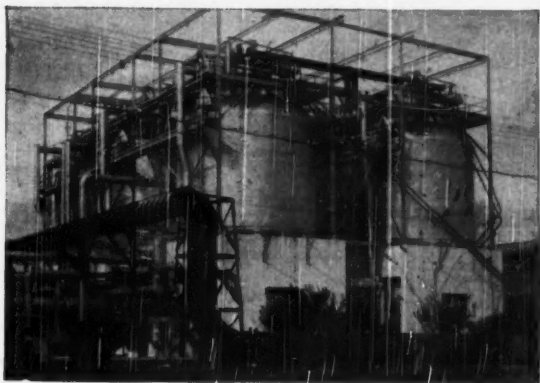
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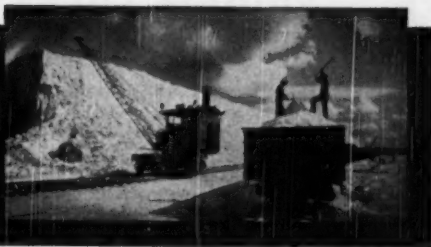
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biochemical interest, e.g. amino acids, proteins, coenzymes, intermediary metabolites are described in concise form with properties and methods for checking the purity of the materials included. Other methods of making these preparations are cited.

In some cases the directions would seem to be almost too brief. However the compilation is under the direction of a capable editorial board and each method has been checked and found to be satisfactory by at least one laboratory besides the one which submitted it.

The directions are designed to be used by students as well as research workers. There can be no question but that this series will be of the greatest convenience to the biochemical laboratory worker and it is to be hoped that in future volumes it will be possible to deal with many more preparations while maintaining the same standards.

### Plastics

**HANDBOOK OF PLASTICS**, by H. R. Simonds, A. J. Weith, and M. H. Bigelow. D. Van Nostrand Company, Inc., New York. 1511 pp., \$25. Reviewed by J. J. Pyle, Chemical Dept, General Electric Co.

THIS second edition of the "Handbook of Plastics," while based in part on the first edition by H. R. Simonds and Carle-

ton Ellis, contains so much new material and represents such a complete revision of the original material that it should be considered a new text on the topic of plastics. The authors are all well-known authorities in the field of plastics and have more than adequately discharged their obligations to the prospective readers of this book.

The purpose of the book is to cover the present state of the industry, the physical and chemical properties of plastics, their production, manufacture and finishing, and all other useful information of interest to users of plastics. The result is an exhaustive but certainly not exhausting treatment of the plastics industry. The text will be of considerable interest and real assistance to anyone manufacturing, fabricating, or using plastics or contemplating entering any of these fields.

The 26 chapters cover the plastics industry from accounting to zein in a simple, stimulating manner. Factual data, charts, tables, definitions, and patent and literature references make the text a useful reference work and also a good point from which to start a more intensive study of selected topics. Since the emphasis is on the technology of plastics the book is for the practical man rather than the theoretical scientist. The

work is well indexed and adequately provided with cross-references.

Errors appear to be a practical minimum and are very minor in character.

The writer recommends the book without reservation to anyone interested in almost any phase of the plastics industry.

### Other Publications

**WOOD WASTE UTILIZATION** is a report of a field survey of manufacturing waste in New England, sponsored by the Federal Reserve Bank of Boston. Bulletin No. 30, 27 pp., \$1. Northeastern Wood Utilization Council, P. O. Box 1577, New Haven 6, Conn.

**MODERN METAL FINISHING** is again being issued after cessation during the war by the Du Pont Co., Wilmington 98, Del. It is a technical bulletin reporting developments in treatment of metals.

**WITCOMBING**, house organ of Witco Chemical Co., 295 Madison Ave., New York 17, N. Y., now appears in an entirely new format. It is of interest to the chemical, paint, and rubber industries.

**INSTRUMENT NEWS**, a new house organ published quarterly by The Perkin-Elmer Corp., Glenbrook, Conn., is designed to further research, material analysis, and production through optical instrumentation.

**CHEMOMONICS** is a new publication of R. S. Aries & Associates, 26 Court St., Brooklyn 2, N. Y., mailed quarterly without charge to interested executives in the chemical process industries. It is devoted to chemical engineering plus economic interpretation.

**FINISHES FOR ALUMINUM** supplies basic information on the various processes for applying surface finishes to aluminum, as well as the characteristics of the finishes so produced; 124 pp. Reynolds Metals Co., Inc., Louisville 1, Ky. **WORLD CHEMICAL DIRECTORY**, 1949 edition, lists over 18,000 firms located in every important country in the world that import and export chemicals, drugs, plastics, and oils. Cross-indexed and including a trade-name index, the 700-p. book sells for \$10; 425 W. 25th St., New York 1, N. Y.

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R*	0.006 - 0.009	0.009 - 0.012 %
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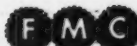
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
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
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## Enzyme Technology

(Continued from page 32)

Hyaluronidase, also known as "spreading factor," is prepared commercially from bull testes. It facilitates the spreading of drug solutions in the skin after subcutaneous injection. Its use in conjunction with anesthetics in dentistry is also under investigation.<sup>39</sup> A general biochemical characterization of these mucolytic enzymes has been published.<sup>20a</sup>

Protein hydrolysates prepared from casein, lactalbumin, liver, muscle, fish and soya proteins are used after severe operations and in cases of impaired digestion of proteins. Enzymatic hydrolysis does not racemize or destroy amino acids; and casein hydrolysates with pancreatic, fungal, and bacterial proteases will yield the same nitrogen balance indexes and protein efficiencies as the whole protein.<sup>40</sup> Acid hydrolysis is comparatively simple but results in the destruction of tryptophan, which has to be supplied from some other source.<sup>41</sup>

## MISCELLANEOUS

The following applications of proteolytic enzymes are less well known.

In the production of dried eggs it is desirable to filter the egg white. This can be accomplished by thinning the whites with proteolytic enzymes.<sup>42</sup> A variety of proteases from animal, vegetable, and fungal sources can be used in tenderizing animal tissues<sup>43</sup>—for example, papain in tenderizing meat and sausage casings, and fungal proteases in the treatment of guts for the production of surgical gut strings.

Fish waste and press water are rich in proteins and animal growth factors. It is necessary to concentrate or dry the waste materials for utilization as animal feed. This operation is facilitated by using proteolytic enzymes to

hydrolyze the gelatinous protein material.<sup>44</sup>

The isolation of biologically active isomers from a racemic mixture of amino acids can be accomplished by esterification of the mixture and hydrolysis with proteolytic enzymes that will split only one of the two optical isomers. The isolation of 1-methionine<sup>45</sup> and 1-tryptophan<sup>46</sup> have been described.

## GENERAL OUTLOOK

In summary, the continued development of industrial enzymes points to a broader application in all industries which process natural materials. Enzymes are not only active on natural materials but also on the corresponding synthetic compounds. For example, urease will hydrolyze natural as well as synthetic urea; catalase will decompose hydrogen peroxide.

Investigations are being carried out on hydrolytic processes in which growing microorganisms are active; for example, in the retting of ramie fibers or in the ripening of cheese. In the near future many new industrial applications will undoubtedly be developed applying similar hydrolytic processes. On the other hand, the use of isolated enzyme systems for the synthesis of foods or chemicals will certainly require additional research.

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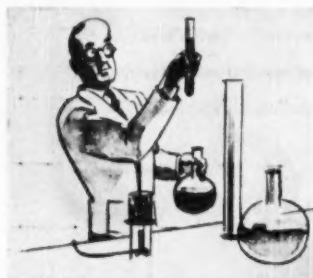
by "DOC"

THE SCENE IS Wyandotte Chemicals Corp.'s Fourth Annual Staff Meeting of the Research and Development Division, assembled at the Statler in Detroit. The time is 3:45 in the afternoon—after a heavy morning and afternoon of some fourteen technical talks. To his feet rises Thomas H. Vaughn, vice-president—research and development. Does he expound on steric hindrance or electronic configurations or the role of research in the chemical economy? Bless him, no! He enlivens his hearers with a public's-eye view of the scientist—as well as some intimate portrayals of Wyandotte's research activities:

"The general public has its own ideas as to the intellect, appearance of, and the type of work done by scientists in general and chemists in particular. It is an established fact that the bona fide scientist, dressed always in a white laboratory frock, spends practically all of his working hours peering through a microscope, inquiring into the mysteries of the unknown:



"The chemist, however, is an odd mutation or peculiar breed of scientist, and his symbol is the test tube:



Many opinions exist as to the full significance of this symbolic stance. Some

feel the chemist is in imminent fear of an explosion occurring before his eyes, others that he is on the verge of a tremendous discovery involving a miraculous color change, while a few—notably chemical engineers—hold that this is simply the characteristic sleeping position of the chemist.

"Wyandotte's research men are similarly typed not only by the public, but at times by people in our own Corporation. When progress on a research problem is slow, the picture which forms in the minds of those impatiently awaiting results is something like this:



WHAT- ME WORRY?

"The friendliness and intelligence apparent on this face is certainly complimentary to Wyandotte scientists, but still it fails to dispel the idea that all scientists are cast from the same mold.

"Versatility and specialization in training and in duties are both important in modern research, and Wyandotte's scientists must collectively shoulder broad duties and individually specialize in definite fields of activity.

"A not inconsiderable portion of our total research activity is spent keeping in touch with the overall progress of the chemical and allied industries and anticipating if possible changes in technology which may affect the operations of the Corporation. One of our chemists with a specially developed sensory organ is engaged in this job:



"In contrast to these generalized duties are the activities of the specialists. Research at Wyandotte of course has many specialized characteristics and tends to breed groups of specialists. Thus we have a very efficient group of specialists on cleaning materials, best typified by this energetic professional:



"In many of our more abstract studies, statistics assumes a very large degree of importance and we have a number of competent individuals, some of whom, like this statistician, are so immersed in their jobs as to put personal comfort aside in order to utilize their full range of statistical equipment:



"The scientist is indeed a specialist, but whether chemist or chemical engineer and no matter how specialized his work, he must constantly engage in library research. Countless hours are spent in this type of activity which may be characterized by the pair of professionals shown busily pouring over the literature:



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## Data Sheets

(Continued from page 35)

This does not mean that a new product bulletin must be a work of literary art—far from it. It must, however, be clearly understandable and it should be neat and attractive with its data arranged logically to tell a story in chronological form. At the same time it must arouse curiosity and must answer most technical questions before they are asked. If, during an evaluation program, illogical questions arise from prospective customers, it is almost certain that the data sheet is not logically presented.

To be fully effective, it must make the reader want to become acquainted and to work with the new compound. In short, it must be a "silent salesman"—and like every good salesman, it must convince the reader that the product may be of value to him.

The data sheet is thus an important link in the chain of new product development: It gives the potential user of a new product the information he must have to translate the material from a laboratory or a pilot-plant curiosity into a commercial "dollar maker." It describes the properties of the product—which, after all, are what make any chemical a leader or a "lagger."

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# Abstracts of United States Patents

A Complete Checklist Covering Chemical Products and Processes

Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

U. S. Patents from Official Gazette—Vol. 625, Nos. 4, 5 (Aug. 23-30) and Vol. 626, Nos. 1, 2 (Sept. 6-13)

## Coatings

**Protective surface treatment of magnesium base alloy by treating with a solution consisting of water, dichromate ion of at least one compound of the group consisting of the dichromates of lithium, potassium, sodium, magnesium, and ammonium, sulfate ion of at least one compound chosen from the group consisting of the sulfates of lithium, potassium, sodium, magnesium, and ammonium, a buffer mixture comprising acetic acid and sodium acetate.** No. 2,480,448. Permanente Metals Corp.

**Producing a boron trifluoride bodied oil, characterized by rapid drying rate, improved color and freedom from crystallization, which comprises heating an unsaturated fatty oil in the absence of a polymerization catalyst to effect rearrangement of fatty acid radicals in said oil and to inactive substances in the oil reactive with boron trifluoride to form salts which in secondary reactions yield water-stable compounds with pigmentary value, without effecting substantial heat bodying and substantial reduction in the iodine value of the oil, and thereafter bodying the heat treated oil at lower temperature in the presence of a small amount of boron trifluoride until the desired degree of bodying is attained.** No. 2,480,485. Procter & Gamble Co.

**Process of packaging by applying a stripplastic webbing to the article to be packaged and applying a stripplastic topcoat composition thereover, said webbing composition comprising a mixture of polyvinyl butyral resin and polyvinyl acetate resin, a compatible plasticizer, a rust-inhibiting oil, and a solvent composition containing at least two solvents.** No. 2,480,524. E. I. du Pont de Nemours & Co.

**Preparing a paint by grinding chlorophyll vegetable matter in the presence of water, precipitating chlorophyll in combination with protein by means of a metal sulfate selected from the group consisting of zinc, magnesium, copper and manganese, stabilizing the chlorophyll by addition of sugar and magnesium sulfate.** No. 2,481,366. U. S. A. as represented by the Secretary of the Navy.

**In producing heat and corrosion resistant steel sheets, the steps which consist of applying to sheets having a blue oxide coating, a coating of petroleum asphalt, and igniting said asphalt whereby the asphalt burns and said blue oxide is reduced to a black oxide.** No. 2,481,424. Empire Steel Co.

**Composition of matter for use in melt-coating operations consisting of a heat stable lower alkanoate ester of cellulose, a heat resistant organic acid ester of an aliphatic alcohol, and a chlorinated diphenyl.** No. 2,481,687. Eastman Kodak Co.

**Process for forming optically smooth, scratch-resistant thermosetting resin coatings on sheets or films of softer organic plastic materials by polymerizing a thin coating of a resin from the class consisting of melamine formaldehyde, urea formaldehyde, and mixtures thereof on the surface of said plastic.** No. 2,481,809. Polaroid Corp.

**Solid composition consisting of a hydrated alkali metal hydroxide of the group consisting of sodium hydroxide and potassium hydroxide and a relatively smaller amount of an alkali metal chloride of the group consisting of sodium chloride and potassium chloride to blacken surfaces of copper and of alloys containing copper.** No. 2,481,854. Eastone, Inc.

**Process of rust inhibiting a metal by pickling the metal; washing the pickled metal; and subjecting said metal, after such cleaning, to the action of an aqueous solution comprising tetra sodium pyrophosphate, sodium meta silicate, and tri sodium phosphate.** No. 2,481,977. Lionel Cinnamon.

## Detergents

**Detergent particles which comprise a core of water-soluble organic sulphate detergent and a surface coating comprising alkali metal silicate.** No. 2,480,579. Colgate-Palmolive-Peet Co.

**Producing a free flowing homogeneous granular detergent which comprises heating a mixture of a surface active, anionic, non-soap, water-soluble salt, organic detergent with a substantially non-hydrated alkali metal polyphosphate to take up as water of hydration substantially all of the water to be added, and with water added to form a slurry at the temperature to which the mass is heated, agitating the resulting mass, then solidifying by cooling without vaporizing water whereby the water is to be taken up as water of hydration on the anionic polyphosphate and reducing the solidified material to granular form.** No. 2,480,730. Food Machinery and Chemical Corp.

## Dyes & Pigments

**Producing a cadmium sulphoselenide pigment by calcining in a non-oxidizing atmosphere, cadmium selenocyanide in the presence of added sulfur and a cadmium compound.** No. 2,479,636. E. I. du Pont de Nemours & Co.

**Obtaining an improved rutile titanium oxide pigment comprising coagulating a previously purified and monobasic acid-aged titanium acid sol by incorporating a sulfate ion-containing compound to effect coagulation, purifying and washing, incorporating a small amount of said product as a seeding material into a hydrolyzable titanium sulfate solution, hydrolyzing the resulting mixture, and then calcining to develop its pigment properties.** No. 2,479,637. E. I. du Pont de Nemours & Co.

**Calcined titanium dioxide pigments carrying a coating of a non-drying water-insoluble liquid alkyl resin which is the reaction product of an organic polycarboxylic acid, a polyhydric alcohol, and a monocarboxylic acid selected from the group consisting of non-drying aliphatic and cycloaliphatic monocarboxylic acids containing from about 6 to about 26 carbon atoms.** No. 2,479,836. American Cyanamid Co.

**Metallized benzimidazole azo dyestuffs.** No. 2,479,944. American Cyanamid Co.

**Azo dyestuffs.** No. 2,480,006. Ciba Ltd.

**In production of water-dispersible titanium dioxide pigments, the step comprising the flocculation of water-dispersed hydroclassified micropulverized calcined titanium dioxide by the addition thereto of a small amount of a hydrolyzable titanium salt.** No. 2,480,092. American Cyanamid Co.

**Benzanthrone-thiophanthraquinone acridine dyes obtained by the caustic alkali condensation of the benzanthronylaminothiophanthraquinones.** No. 2,480,110. E. I. du Pont de Nemours & Co.

**Aminobenzanthrone-thiophanthraquinone acridine dyes obtained by the caustic alkali condensation of the benzanthronyl-aminothiophanthraquinones.** No. 2,480,112. E. I. du Pont de Nemours & Co.

**Production of improved anthraquinone dyestuffs by condensing a hydroxy-substituted nitro-antraquinone free of other functional groups with an organic primary amine by reacting a mixture consisting of a hydroxy-substituted nitro-antraquinone, an organic primary amine and a substantial quantity of water.** No. 2,480,269. Celanese Corp. of America.

**Dyeing nylon hosiery composed in part of monofilament and in part of multibale yarns with cadmium water insoluble dispersed cellulose acetate dyes, which comprises treating the nylon in an aqueous bath containing tannic acid, and thereafter applying the water insoluble dispersed dyes by heating the nylon in the aqueous dispersion of the dye.** No. 2,480,775. E. I. du Pont de Nemours & Co.

**Acid dyestuffs of the anthraquinone series.** No. 2,480,985. Sandoz Ltd.

**Production of cyanine dyestuffs.** No. 2,481,022. Ilford Ltd.

**Fluorescent pigment comprising the product of calcining in a reducing atmosphere a mixture consisting of a base material composed of zinc oxide and magnesium oxide, and lithium sulfate.** No. 2,481,344. New Jersey Zinc Co.

**Vat dyestuff obtained by heating a solution of aminodibenzanthrone in a substantial excess of 1-chloro-2,4-dinitrobenzene.** No. 2,481,449. General Aniline & Film Corp.

**The vat dyes, 3'-phthaloylacridones.** No. 2,481,744. Imperial Chemical Industries Ltd.

**Cyanine dyestuffs.** No. 2,481,953. Gevaert Co. of America, Inc.

**In production of a cadmium sulfide pigment in which batch ingredients containing cadmium sulfide, cadmium oxide and selenium are calcined the step which comprises mixing with said batch ingredients, prior to calcination, a barium compound taken from the group consisting of barium carbonate and barium peroxide.** No. 2,482,906. E. I. du Pont de Nemours & Co.

## Explosives

**Non-mercuric primer mixture containing basic lead stypthate, barium nitrate, antimony sulfide, nitrocellulose, and tetracene.** No. 2,480,141. Federal Cartridge Corp.

**Propellant powder comprising nitrocellulose as the main explosive ingredient and 5-aminotetrazole.** No. 2,480,852. George C. Hale and Ludwig F. Audrieth.

**Low power explosive compositions comprising ammonium nitrate, detonating explosive sensitizer ingredient, an oxidizable ammonium salt selected from the group consisting of ammonium chloride, ammonium sulfate, and ammonium phosphate, and an insoluble metal carbonate.** No. 2,481,795. Imperial Chemical Industries Ltd.

## Inorganics

**Stabilized composition comprising discrete particles of calcium carbonate and sodium thiosulfate as an oxidation-reduction potential reducing substance.** No. 2,479,583. Calcium Carbonate Co.

**Producing a highly-active suspension of solid potassium hydroxide by mixing a hydrous potassium hydroxide with a liquid water-immiscible alkyl acetal which does not substantially react irreversibly with the potassium hydroxide, heating above the melting point of the hydrous potassium hydroxide and distilling off any water which may be present in excess of about one mole of water per mole of potassium hydroxide, then cooling to a solidified potassium hydroxide while vigorously agitating to produce a finely-divided, highly-active suspension of potassium hydroxide.** No. 2,479,691. Commercial Solvents Corp.

**Producing a highly-active suspension of solid potassium hydroxide by mixing a hydrous potassium hydroxide with a liquid dialkyl ether which does not substantially react irreversibly with the potassium hydroxide and in which the alkoxy groups are attached to different carbon atoms, heating the mixture above the melting point of the hydrous potassium hydroxide and distilling off any water in excess of about 1 mole of water per mole of potassium hydroxide, then cooling to solidify the potassium hydroxide while agitating to produce a finely divided highly-active suspension of potassium hydroxide.** No. 2,479,692. Commercial Solvents Corp.

**Producing a highly-active-suspension of hydroxide by mixing a hydrous potassium hydroxide with a liquid hydrocarbon and a primary monohydric alcohol containing from 3 to 10 carbon atoms, heating the mixture above the melting point of the hydrous potassium hydroxide and distilling off any water which may be present in excess of about one mole of water per mole of potassium hydroxide, then cooling to solidify the potassium hydroxide while vigorously agitating to produce a finely-divided, highly active suspension of potassium hydroxide.** No. 2,479,693. Commercial Solvents Corp.

**Producing a highly-active suspension of solid potassium hydroxide which comprises mixing a hydrous potassium hydroxide with a monoether and a primary monohydric alcohol containing from 4 to 8 carbon atoms, heating the mixture above the melting point of the hydrous potassium hydroxide and distilling off any water which may be present in excess of about one mole of water per mole of potassium hydroxide, then cooling to solidify the potassium hydroxide while vigorously agitating to**

produce a finely-divided, highly-active suspension of potassium hydroxide. No. 2,479,694. Commercial Solvents Corp.

Purification of hydrogen sulfide with a slurry of Mg and Ca hydroxides. No. 2,479,781. Phillips Petroleum Co.

Reactivating a poisoned silver surface catalyst employed to catalyze the oxidation of olefins to olefin oxides, by passing a stream of ammonia and water vapor over said catalyst. No. 2,479,883. Allied Chemical & Dye Corp.

Reactivating a poisoned silver surface catalyst employed to catalyze the oxidation of olefins to olefin oxides, by first passing a member of the group consisting of halogens, alkyl halides and alkylene halides over said catalyst and thereafter passing a stream of oxygen, ammonia and water vapor. No. 2,479,884. Allied Chemical & Dye Corp.

Revivifying an overheated silver surface catalyst employed to catalyze the oxidation of olefins to olefin oxides in a catalyst converter containing a body of said catalyst, by flowing a member of the group consisting of halogens, alkyl halides and alkylene halides through said body of catalyst, and thereafter flowing a stream of ammonia and water vapor over said body of catalyst. No. 2,479,885. Allied Chemical & Dye Corp.

In producing titanium chloride wherein titanium containing raw material is treated with a reducing agent and chlorine gas, the steps of mixing a carbonizable carbonaceous material, a titanium-containing material capable of yielding upon chlorination volatile titanium chlorides and a small amount of alkali metal hydroxide, pressing the mixture into a plurality of granules, heating said granules under non-oxidizing conditions until carbonization and cementation occurs and chlorinating the same. No. 2,479,904. National Lead Co.

Preparing easily filterable hydrous vanadium oxide from an alkali metal vanadate solution wherein sodium vanadate, admixing with a solution of mineral acid an amount of alkali metal vanadate solution consisting of from about 10% to about 45% of that required to neutralize said mineral acid solution to form a hydrous vanadium oxide nuclear composition, and adding said nuclear composition to additional alkali metal vanadate solution meanwhile agitating until the vanadium content of the mixture is substantially completely precipitated as hydrous vanadium oxide. No. 2,479,905. National Lead Co.

Catalyst consisting of activated alumina and beryllium as beryllium oxide. No. 2,480,520. Pure Oil Co.

Removal of acetylic alkali metal from a dry inorganic oxide gel which comprises saturating said gel with carbon dioxide and thereafter washing said gel with an aqueous solution of carbonic acid. No. 2,480,628. Socony-Vacuum Oil Co., Inc.

Preparing hard granules of inorganic oxide gel containing a major proportion of silica, which comprises forming a hydrogel comprising a major proportion of silica, freezing by immersion in a water-immiscible cooling liquid, thawing to produce a mass of shrunken hydrogel granules and an aqueous liquid, separating said aqueous liquid from said hydrogel granules, subjecting said granules in substantially the form assumed upon thawing to extrusion through a die and drying the extruded hydrogel. No. 2,480,669. Socony-Vacuum Oil Co., Inc.

Producing a material composed of sylvite particles with a brine saturated to sylvite and containing at least one member selected from the group consisting of long chain aliphatic amines and their water soluble acid addition salts wherein the hydrocarbon group of the aliphatic amines and their water soluble acid addition salts wherein the hydrocarbon group of the aliphatic amine contains between about 12 to about 20 carbon atoms, separating the sylvite particles and drying. No. 2,480,694. International Minerals & Chemical Corp.

Seed for production of titanium dioxide process of making same. No. 2,480,869. Max J. Marx.

In the manufacture of a magnesium oxide suitable for compounding with synthetic rubber of the chloroprene type, forming a slurry of neutral magnesium carbonate and magnesium hydroxide, heating whereby a slurry is formed consisting of basic magnesium carbonate together with a substantial amount of uncombined residual magnesium hydroxide, spray drying the slurry to form a dry divided material, and calcining to convert both basic magnesium carbonate and magnesium hydroxide components to magnesium oxide. No. 2,480,904. Marine Magnesium Products Corp.

Production of gaseous chlorine dioxide by the reaction between gaseous sulphur dioxide and an aqueous solution of sodium chlorate. No. 2,481,240. Canadian International Paper Co.

In removal of chlorine from a gaseous mixture containing chlorine dioxide, chlorine and water vapor, the step of adding gaseous sulphur dioxide. No. 2,481,241. Canadian International Paper Co.

Separating cesium as the bromide from a cesium-containing ore containing alkali metals, by digesting the ore in hydrobromic acid, separating the gangue, adding isopropyl alcohol to precipitate the alkali metal bromides including the cesium bromide, separating the precipitate, treating the precipitate with liquid bromine to dissolve the cesium bromide in the liquid bromine, separating the resulting solution of cesium bromide in liquid bromine, from the undissolved portion of the precipitate, and evaporating the liquid bromine to crystallize cesium monobromide. No. 2,481,455. Dow Chemical Co.

Preparing silica zirconia gel, by fusing a zirconium silicate ore in an alkaline flux, adding alkaline silica dispersing the obtained product in aqueous medium and adding acidic material to effect formation of a colloidal sol setting to a hydrogel. No. 2,481,493. Houdry Process Corp.

Activating bleaching clays by heating to boiling a pulp of finely divided bleaching clay in an aqueous solution of sodium silicate together with aqueous sodium silicate treated clay mixture with an aqueous solution of calcium chloride, separating and washing the water insoluble calcium compounds and clay residue, treating the insoluble calcium compounds and clay residue with magnesium chloride aqueous solution to form insoluble magnesium compounds, and separating out the insoluble magnesium compounds and clay residue. No. 2,481,641. Ernest C. Bierce.

Producing the substantially pure monofluorophosphate of an alkali metal of the group consisting of sodium and potassium by subjecting the metaphosphate and the fluoride of the metal to fusion. No. 2,481,807. Ozark-Mahoning Co.

## Leather

Improving the qualities of suede leather by subjecting suede leather to aqueous treatment in a bath comprising a sulfonated fat liquoring agent and further comprising an aqueous dispersion of a synthetic water insoluble polymer selected from the group consisting of vinyl acetate polymer, butylmethacrylate polymer and chloro-2-butadiene-1,3 polymer. No. 2,481,933. E. I. du Pont de Nemours & Co.

## Metals

Electrodepositing zinc from an alkaline aqueous cyanide-zinc plating bath to which has been added the product of the reaction of an aqueous solution of gluconic acid containing less than 4% of reducing sugars and an aqueous alkaline solution of a chromium compound selected from

the group consisting of trivalent and hexavalent chromium compounds. No. 2,479,670. Poor & Co.

Recovering precious metals selected from the group consisting of gold and silver from ores which comprises subjecting the ore to cyanidation, precipitating precious metals by means of activated carbon containing sufficient magnetic material to render the carbon particles magnetic, separating the magnetic precious metal-bearing carbon magnetically. No. 2,479,930. American Cyanamid Co.

Making electrodeposited iron of pure, brittle character by two stages of electrodeposition from ferrous chloride. No. 2,480,156. Buel Metals Co.

Beneficiating chromiferous and titaniferous ores by mixing comminuted ore and anhydrous calcium chloride, and heating to volatilize iron chloride from said ore. No. 2,480,184. Union Carbide and Carbon Corp.

Producing aluminum by the electrolysis, of a fused bath of alumina dissolved in cryolite. No. 2,480,474. Reynolds Metal Co.

Production of alkali metal by passing a molten potassium compound reducible by sodium with sodium vapor into a column and thereby forming a sodium-potassium alloy and a slag composed predominantly of sodium and the anion of said potassium compound, withdrawing alkali metal comprising potassium from the upper end of said column, withdrawing said slag from the lower end of said column and passing it to a closed chamber, heating the withdrawn slag in said chamber to vaporize sodium carried by it, and returning the thus vaporized sodium to the column. No. 2,480,655. Mine Safety Appliances Co.

Electrolytic recovery of nickel from Ni chloride. No. 2,480,771. International Nickel Co., Inc.

Making electrolytic dendritic powdered iron from an aqueous solution of ferrous chlorides and ammonium chloride. No. 2,481,079. Chrysler Corp.

Two-stage gaseous reduction of iron ore with said ore in the form of a dense, fluidized bed of powdered ore and under the influence of a normally gaseous hydrocarbon. No. 2,481,217. Standard Oil Development Co.

Two-stage reduction process for producing metal catalyst of the class consisting of iron oxide and cobalt oxide by forming the catalyst material in powdered form into a fluidized mass and treating it with an impure hydrogen gas containing water vapor. No. 2,481,226. Standard Oil Development Co.

Electropolishing of metallic tantalum by making it anode in an electrolyte, containing hydrofluoric and hydrochloric acid. No. 2,481,306. Pennsylvania Salt Mfg. Co.

Separation of columbium and tantalum comprising digesting the ore with concentrated sulfuric acid and a sulfate salt; adding water; separating the water soluble and water insoluble products; treating the water insoluble products containing columbium and tantalum with oxalic acid solution to precipitate an alkali metal ion to effect solution of the water insoluble products; adjusting the pH to between 2 and 3 by addition of an acid; adding a weak base that will not produce an insoluble precipitate of columbium at pH less than 5.0; permitting the pH to rise to between 4.5 and 5.0 to precipitate tantalum values and separating the precipitated tantalum from the solution. No. 2,481,584. Union Carbide and Carbon Corp.

## Organic

In the preparation of paraldehyde from acetaldehyde, the improvement which comprises contacting a fixed bed of an acidic cation exchanger with acetaldehyde and separating the paraldehyde from the effluent mixture. No. 2,479,559. Publiker Industries, Inc.

Converting propylene oxide to a product in which the ratio of allyl alcohol to propionaldehyde is at least 2.3 to 1, comprising passing vaporized propylene oxide through a heating chamber in the absence of a gas reactive with said propylene oxide and in contact with a molecular rearrangement catalyst consisting of those selected from the group consisting of chromic oxide, nickel oxide, stannic oxide, urano-uranic oxide, uranium trioxide, molybdenum trioxide, and cobaltous oxide. No. 2,479,632. Wyandotte Chemicals Corp.

Producing propylamine by heating N-aminoethyl ethanolamine in the presence of added hydrogen and a copper-containing condensation catalyst. No. 2,479,657. Carbide & Carbon Chemicals Corp.

Reacting an ester of a lower acylaminocycanoacetic acid with a compound of the formula  $RK'CHX$ , where R is a member of the group consisting of hydrocarbon radicals and mono- or dihydrocarbon radicals, R' is a member of the group consisting of alkyl and hydrogen radicals, and X is a halogen, in the presence of an alkaline condensing agent. No. 2,479,662. Wintrop-Stearns, Inc.

3-Carbamyl-2-piperidine. No. 2,479,690. Commercial Solvents Corp.

Manufacture of an amine by treating an indane compound which contains an N-piperidino-methyl group in the 2-position of the five-membered ring and a member selected from the class consisting of a keto group, a carbinol group, a substituted carbinol group and an alkylene group in the 1-position of the five-membered ring, with hydrogen in the presence of a catalyst selected from the group consisting of platinum and palladium at atmospheric pressure whereby the reduction takes place without affecting the degree of unsaturation of the six-membered carbon ring of the indane compound. No. 2,479,744. Ciba Pharmaceutical Products, Inc.

Hydrogenation products of N-phenyl-3,5-diethyl-2-propyldipropylidene. No. 2,479,815. B. F. Goodrich Co.

Preparing a new diacidic acid, monohydrochloride, by heating a benzhydryl halide with a 1-alkyl-4-piperidol wherein the alkyl group contains from 1 to 4 carbon atoms. No. 2,479,843. Nopco Chemical Co.

In preparation of nitro amines, the process which comprises a condensation reaction between formaldehyde, a primary aralkylamine having the formula  $R_1-NH_2$  and a nitroalkane. No. 2,479,873. Commercial Solvents Corp.

Producing nitriles and amines by the direct reaction of ammonia with olefins in contact with a catalyst consisting of a catalytically effective reduced metal compound, consisting of an essential component and an oxide of the metal selected from the group consisting of cobalt and nickel deposited on an inert carrier and containing in excess of 1% of sodium. No. 2,479,879. Sinclair Refining Co.

Tetraalkyl phenyl triphosphates. No. 2,479,938. Monsanto Chemical Co.

Treating a solution of a dialkyl chlorophosphate in an inert organic solvent with water and then removing hydrogen chloride from said solution. No. 2,479,939. Monsanto Chemical Co.

Alkylmagnesiumnitriles. No. 2,479,942. American Cyanamid Co.

Alpha thionylamide derivatives. No. 2,479,944. American Cyanamid Co.

Monoalkamine esters of pyrrole-3-carboxylic acids. No. 2,479,971. American Cyanamid Co.

Monoalkamine esters of pyrrole-3-carboxylic acids. No. 2,479,972. American Cyanamid Co.

Preparing 1-naphthylamine-2-sulfonic acid by heating a dry alkali naphthionate with a dry neutralizing salt to neutralize acids set free in the reaction, the cation portion of said salt being selected from the group consisting of alkali metal and alkali earth metal cations, and

said salt being a salt of an acid weaker than sulfurous acid. No. 2,479,990. American Cyanamid Co.

Preparing mercaptans and alkyl sulfides comprising contacting an olefin with hydrogen sulfide in the presence of boron trifluoride and hydrogen fluoride. No. 2,479,996. Pure Oil Co.

Preparing vinyl fluoride by contacting a mixture of acetylene, hydrogen fluoride and hydrogen chloride with a catalyst comprising mercuric chloride. No. 2,480,021. Phillips Petroleum Co.

Heterocyclic nitrogen base salts of 3-methyl-butyl, 2-ethyl-hexyl orthophosphates. No. 2,480,056. Gulf Oil Corp.

Reacting an acidulated 1-hydroxy-2-alkyl-4-amino-naphthalene having the general formula 1-hydroxy-2-(C<sub>n</sub>H<sub>2n+1</sub>) 4-amino-naphthalene, wherein "n" is an integer from 4 to 12, inclusive, with chromic anhydride in the presence of a water-soluble ketone and separating a 2-alkyl-1,4-naphthoquinone from the reaction product. No. 2,480,071. William M. Ziegler.

Adding a mixture of acetic acid and a 1-hydroxy-2-alkyl-naphthalene having the general formula: 1-hydroxy-2-(C<sub>n</sub>H<sub>2n+1</sub>) naphthalene, wherein "n" is an integer from 1 to 10, inclusive, to an aqueous solution of chromic anhydride; and, separating a 2-alkyl-1,4-naphthoquinone from the reaction product. No. 2,480,072. William M. Ziegler.

Cyanooctadecylphenyl esters by reacting an acyloxymethylphenyl ester of a monocarboxylic acid of two to eight carbon atoms and oleonitrile. No. 2,480,077. Rohm & Haas Co.

Production of N,N'-dibenzylcystine by reduction of 2-phenylthiazolidine-4-carboxylic acid in solution in liquid ammonia with sodium metal and recovery of the N,N'-dibenzylcystine. No. 2,480,079. Upjohn Co.

Perhalomethylcyclohexene, containing fluorine and chlorine as the only halogens in the molecule, wherein the methyl group contains three fluorine atoms. No. 2,480,080. Purdue Research Foundation.

A perhalocyclohexane containing chlorine and fluorine as the only halogens, wherein CF<sub>2</sub> groups are present in the ring, and wherein the number of chlorine atoms is from 1 to 3, inclusive. No. 2,480,081. Purdue Research Foundation.

Producing carbamyl chlorides by reacting in the vapor phase, phosgene and a compound selected from the group consisting of primary and secondary amines. No. 2,480,088. Monsanto Chemical Co.

Reacting in the vapor phase, a primary amine and phosgene and separating the resulting hydrogen chloride from the vaporous reaction product. No. 2,480,089. Monsanto Chemical Co.

Production of 3-bromopyridine and its hydrochloride. No. 2,480,091. Dow Chemical Co.

Benzanthronylamino-thiophanthraquinone compounds. No. 2,480,109. E. I. du Pont de Nemours & Co.

Benzanthronylamino-thiophanthraquinone compounds. No. 2,480,111. E. I. du Pont de Nemours & Co.

Esters of a mixture of monohydroxy oxyethylene oxy-1,2-propylene aliphatic monoethers in which the aliphatic monoether group has from 1 to 14 carbon atoms and in which the ratio of oxyethylene groups to oxy-1,2-propylene groups combined in the molecule ranges from 3 to 1 to 1 to 9 with an organic carboxylic acid consisting solely of the elements carbon, hydrogen and oxygen and having from 1 to 2 carboxyl groups and from 2 to 20 carbon atoms to the molecule. No. 2,480,185. Carbide and Carbon Chemicals Corp.

Heterocyclic polynuclear keto aliphatic acids. No. 2,480,220. G. D. Searle & Co.

Cashew nut shell liquid and kernel oil separation by adding a quantity

of an alcohol selected from the group consisting of methyl alcohol, ethyl alcohol and isopropyl alcohol to selectively dissolve said cashew nut shell liquid and then separating said cashew kernel oil from said solution. No. 2,480,221. Harvel Corp.

9-fluorenyl ester of a beta-lower-dialkyl-aminopropionic acid. No. 2,480,224. G. D. Searle & Co.

Reacting a phenolic compound containing a substitutable hydrogen atom attached to the ring with a compound capable of yielding a hydrocarbon radical at condensation conditions in the presence of a catalyst prepared by reacting boric acid and a metal halide of the Friedel-Crafts type with evolution of hydrogen halide. No. 2,480,254. Universal Oil Products Co.

Manufacturing a saturated organic amine containing a quaternary carbon atom which is at least one carbon atom removed from the carbon atom attached to the amino group, which comprises reacting a tertiary monohalo-saturated hydrocarbon with an aliphatic non-tertiary monohalo-saturated hydrocarbon in the presence of a Friedel-Crafts metal halide catalyst selected from the group consisting of the chlorides and bromides of aluminum, iron, bismuth, silicon and zinc to form a higher molecular weight monohalo-saturated hydrocarbon containing a quaternary carbon atom which is at least one carbon atom removed from the carbon atom attached to the halogen, reacting said higher molecular weight monohalo-saturated hydrocarbon with a nitrogen-containing compound selected from the group consisting of ammonia and organic amines and treating the resultant product with an alkali. No. 2,480,266. Universal Oil Products Co.

Reacting at alkylating conditions in the presence of an alkylation catalyst an alkylatable aromatic compound and a bicycloheptene. No. 2,480,267. Universal Oil Products Co.

Producing bicyclic alkyl aromatic compounds by reacting an aromatic compound having at least one replaceable nuclear hydrogen atom and a bicycloalkene containing a ring of six carbon atoms and a ring of five carbon atoms in the presence of an acid-acting alkylating catalyst at an alkylating temperature. No. 2,480,268. Universal Oil Products Co.

Reacting 2-methyl-4-amino-5-alkoxymethyl-pyrimidine dihydrochloride with an aliphatic nitrite in the presence of an alcohol as a solvent to form 2-methyl-4-amino-5-alkoxymethyl-pyrimidine. No. 2,480,326. Hoffmann-La Roche, Inc.

Manufacture from vinylideneacetone of a product consisting substantially of vinylideneacetoneamine by subjecting the vinylideneacetoneamine to hydrogenation in the presence of a nickel catalyst. No. 2,480,329. William R. Warner & Co., Inc.

Preparing 1,4-dicyclo-2-butene by reacting in the liquid phase a 3,4-dihalo-1-butene with at least two molar equivalents of hydrogen cyanide under acidic conditions. No. 2,477,617. E. I. du Pont de Nemours & Co.

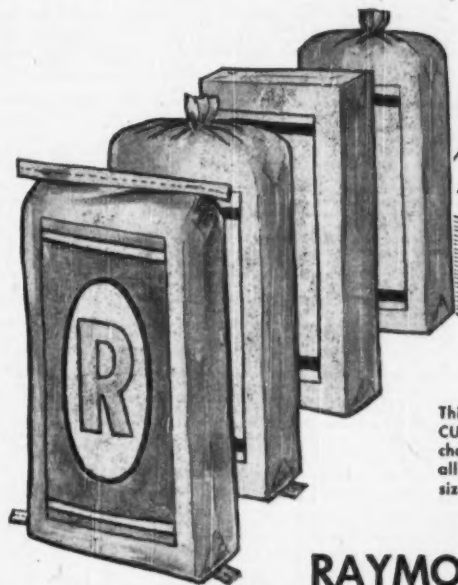
Metal derivatives of orthocarbonyl-benzenethiol. No. 2,480,342. Hoffmann-La Roche, Inc.

Tetrastearate of tetrahydro-3,3,5-tris-(hydroxymethyl)-5-methyl-4-pyranol. No. 2,480,348. General Mills, Inc.

Allylene dihalide salts of N-dialkylaminoalkyl-phenothiazines. No. 2,480,355. Societe des Usines Chimiques Rhone-Poulenc.

Recovering anhydrous cyanacetic acid from an aqueous inorganic salt solution, which comprises extracting the acid with a solvent comprising an aliphatic ketone of the group consisting of methyl isobutyl ketone and methyl oxide to form an acid-rich, aqueous ketone layer, and a substantially acid and ketone-free, salt-rich, briny layer, separating, distilling the acid-ketone layer to remove the water as an azeotrope with

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the ketone and leave an anhydrous acid-ketone solution, and recovering the acid from said solution. No. 2,480,380. Kay-Fries Chemicals, Inc.

Producing a substituted alpha amino acid amide which comprises heating a reaction mixture consisting of 2,5 di-keto piperazine, water and a member of the group consisting of primary and secondary alkyl amines, and alkylene polyamines. No. 2,480,439. Frederick C. Bersworth.

Preparation of alkaline earth metal salts of thiophene sulfonic acid including the steps of contacting thiophene with fluosulfonic acid to produce a mixture of thiophene sulfonyl fluoride and thiophene sulfonic acid and contacting the resulting mixture in aqueous solution with an alkaline earth hydroxide to convert both said compounds to an alkaline earth salt of thiophene sulfonic acid and to precipitate an alkaline earth fluoride. No. 2,480,465. Harshaw Chemical Co.

Production of a member of the group consisting of alkali metal salts of trifluoroacetic acid and alkaline earth metal salts of trifluoroacetic acid by reacting acetone with fluorine in the vapour phase in the presence of a diluent gas inert to fluorine and in a reaction vessel containing a catalyst mass selected from the group consisting of silver and gold. No. 2,480,467. Minister of Supply in His Majesty's Government of United Kingdom of Great Britain and Northern Ireland.

Countercurrent hydrolysis of fat. No. 2,480,471. Colgate-Palmolive-Peet Co.

Stabilized aqueous solution of a salt of 2-sulfanilamido-5-carboxythiazole, said solution containing bisulfite ions as a stabilizer. No. 2,480,532. Allied Laboratories, Inc.

Hydroxy, halogen substituted diaphenylmethanes. No. 2,480,533. Allied Laboratories, Inc.

Making an oil soluble soap of wax acids by treating a naphtha solution of substantially hydroxy-acid-free oxidized petroleum wax with ammonia to convert its organic acid-ester constituents to ammonium salts, reacting such salts in naphtha solution with magnesium oxide to convert them to magnesium soaps. No. 2,480,564. Cities Service Oil Co.

Preparation of  $\alpha$ -alkoxy acids and esters which comprises effecting a reaction between an ethylene sulfoxide, an alkyl carboxylic acid and an acid in accord with the equation  $\text{ROR} + \text{R}'\text{CH}(\text{OH})\text{COOH} \rightarrow \text{R}'\text{CH}(\text{OR})\text{COOH} + \text{R}'\text{OH}$  wherein R designates a hydrocarbon radical, and R' and X designate a radical selected from the group consisting of hydrogen and hydrocarbon radicals. No. 2,480,586. E. I. du Pont de Nemours & Co.

Preparing organic sulphates which comprises treating a mineral oil extract with stannic chloride and then with a sulphonating agent. No. 2,480,592. Colgate-Palmolive-Peet Co.

Removing impurities and salt impurities from an oil solution containing oil-soluble polyvalent metal sulphates by the double decomposition of alkali metal sulphates and polyvalent metal compounds which comprises treating said oil solution with an inorganic acidic material capable of forming water-soluble salts with polyvalent metals and filtering to remove insoluble salts thus formed. No. 2,480,638. Standard Oil Development Co.

Production of carbon disulfide by reaction between carbon and sulfur with a bed of hot fluidized carbon and sulfur vapor. No. 2,480,639. Standard Oil Development Co.

Preparing di-alkene by hydrolyzing 5-isopropyl hydantoin with an aqueous alkali metal hydroxide. No. 2,480,644. Merck & Co., Inc.

2-ethyl-3-hydroxy-4,5-bis-(hydroxymethyl)-pyridine hydrohalide. No. 2,480,649. Merck & Co., Inc.

Composition of matter represented by the formula:  $(\text{R}_1\text{CO})\text{CH}(\text{COR}_2)\text{CH}_2\text{NHR}_3$  wherein R<sub>1</sub> is an alkoxy group, R<sub>2</sub> is a substituent selected from the class consisting of alkyl and alkoxyalkyl and R<sub>3</sub> is an aromatic acyl group. No. 2,480,683. Merck & Co., Inc.

Acid amides of pectinic acid. No. 2,480,710. California Fruit Growers Exchange.

9-benzothianthrene. No. 2,480,746. E. I. du Pont de Nemours & Co.

Chromium-containing phenolic amine reaction product. No. 2,480,754. Gulf Research & Development Co.

2,6-anhydro-1-nitro-1-deoxyheptitol. No. 2,480,785. Corn Products Refg. Co.

Preparing 4,5-dihydro-2-imidazolinones by heating an N-monoformyl derivative of an ethylenediamine in which the unreacted nitrogen radical has at least one acid-reactive hydrogen radical with sulphur. No. 2,480,819. Monsanto Chemical Co.

Preparing a metal derivative of an organic compound which comprises reacting a solution in an organic solvent of an organic compound containing at least one radical selected from the group consisting of -OH and -SH with a solution of an inorganic metal salt in liquid ammonia, said inorganic metal salt being selected from the group consisting of the salts of tin, lead, iron, antimony, bismuth and arsenic. No. 2,480,823. Texas Co.

Preparing thioether sulfonates by heating with evolution of water of reaction a mercaptan which contains reactive hydrogen only in its sulphydryl group, and which contains at least six carbon atoms, with an alkali metal isethionate,  $\text{HOCH}_2\text{CH}_2\text{SO}_3\text{M}$  wherein M represents an alkali metal, in the presence of an alkali hydroxide as a catalyst. No. 2,480,859. Rohm & Haas Co.

Preparation of 2-carboalkoxy-1,3-butadiene dimers by pyrolysis of  $\Delta^1$ -carboalkoxy cyclohexenes. No. 2,480,992. B. F. Goodrich Co.

In producing a hydrocarbon oil of high styrene content from an oil containing a lower styrene content and at least one like-boiling aromatic non-styrene component, the step which comprises fractionally distilling a mixture of such oil and an azeotropic agent of the group consisting of alkyl lactates in which the alkyl group contains not more than six carbon atoms and methyl glycolate. No. 2,480,919. Allied Chemical & Dye Corp.

Process which comprises contacting a mixture of a xylene and benzene with a catalyst consisting essentially of hydrogen fluoride to produce toluene. No. 2,480,939. Pan American Refining Corp.

Producing an alkyl tertiary butyl ether by contacting isobutylene and an alcohol from the group consisting of primary and secondary saturated aliphatic alcohols of from 1 to 12 carbon atoms, with an organic hydrogen ion exchange catalyst of the sulfonated resin type in which the functional group is  $\text{SO}_3\text{H}$ . No. 2,480,940. Atlantic Refining Co.

Making  $\alpha$ , $\beta$ -dimethylsuccinonitrile by heating a 2,3-dicyano-3-buten-2-yl ester of a monocarboxylic acid. No. 2,480,961. U. S. Rubber Co.

In a process for the controlled oxidation of hydrocarbons by the action of oxygen in the presence of hydrogen bromide, the improvement providing a more complete combination of oxygen and allowing the use of less hydrogen bromide which comprises, replacing from 0.1 to 10% of the hydrocarbon with a monochloride of a three carbon atom acrylic hydrocarbon. No. 2,480,971. Shell Development Co.

Manufacture of 1:1:1-trichloroethane, by bringing free chlorine into contact with ethylene dichloride, to which phosphorus pentachloride has been added. No. 2,480,982. Celanese Corp. of America.

Direct production of a cyclopentanecarboxaldehyde by subjecting a tetrahydrofuran to the action of a dehydration catalyst. No. 2,480,990. Shell Development Co.

Free saturated keto fatty acid containing from 8 to 30 carbon atoms and, at positions  $\alpha\alpha'$  to a keto group, two halogen atoms selected from the

group consisting of chlorine and bromine atoms. No. 2,481,036. Nopco Chemical Co.

Inhibiting the auto-polymerization of acrylonitrile with para-tert-butyl catechol. No. 2,480,980. Shell Development Co.

Reacting a monohaloalkane having at least three carbon atoms with a halo-olefin in the presence of a metal halide catalyst of the Friedel-Crafts type to produce a polyhaloalkane and reacting said polyhaloalkane with a hydroxy compound selected from the group consisting of water and aliphatic alcohols. No. 2,481,157. Universal Oil Products Co.

Producing a polyhalo-alkane by reacting in the presence of a Friedel-Crafts metal halide catalyst a monohaloalkane having at least three carbon atoms with a halomonoolefin. No. 2,481,158. Universal Oil Products Co.

Condensing 1,1-dichloroethylene and a monochloro-hydrocarbon selected from the group consisting of a monochlorocycloalkane and a monochloroalkane having at least three carbon atoms in the presence of a Friedel-Crafts catalyst. No. 2,481,159. Universal Oil Products Co.

Producing a higher boiling haloalkane by combining in the presence of a Friedel-Crafts halide catalyst a monohaloalkane and a monolefinic compound selected from the members of the group consisting of a monoolefin and a halomonoolefin. No. 2,481,160. Universal Oil Products Co.

Dehydrofluorination with copperated metal catalysts. No. 2,481,207. Phillips Petroleum Co.

Dehydrofluorination with metallic mixtures as catalyst. No. 2,481,208. Phillips Petroleum Co.

Azeotropic distillation of aqueous isopropanol contaminated by acetone by isopropyl ether. No. 2,481,211. Standard Oil Development Co.

Continuously reducing aromatic compounds to the corresponding aromatic amines by providing a reaction zone containing a plurality of spaced beds of a hydrogenation catalyst. No. 2,481,245. Standard Oil Development Co.

Treating a compound selected from the group consisting of N-alkyl-N' and (2-alkano)ethylenediamine and N,N'-bis(2-alkano)ethylenediamine, with an equivalent amount of nitric acid and an equivalent amount of a dehydrating fatty acid anhydride in the presence of a halide-ion-forming catalyst, and then separating the nitroalkyl-nitramine. No. 2,481,283. U. S. A. by the Secretary of the Navy.

Making carboxylic acid by contacting o-aminophenyl in the liquid phase with an oxygen-containing gas in the presence of graphite. No. 2,481,292. Monsanto Chemical Co.

Treatment of tall oil by heating the alkali soap of tall oil with an amount of alkali at least 100% in excess of the combined alkali in the soap to effect isomerization and degradation of the unsaturated fatty acids into saturated fatty acids of a lower carbon content and to convert the rosin present in the original tall oil into a more saturated form, liberating the fatty acids and the stabilized rosin by acidification with strong acid and separating the fatty acid fraction from the stabilized rosin by fractional distillation. No. 2,481,356. Ernest Segeßmann and Nicholas M. Mohar.

Heterocyclic-substituted carbamides. No. 2,481,377. Shell Development Co.

Preparation of phenolphthalein beta,beta'-digluconide octaacetate. No. 2,481,417. Atlas Powder Co.

Cyclic aminobenzaldehyde acetals of 1,2- and 1,3-glycols of 2 to 4 carbon atoms. No. 2,481,434. E. I. du Pont de Nemours & Co.

1-substituted 2,5-diketeto-7-methyl-pyrimidopyrazoles. No. 2,481,466. General Aniline & Film Corp.

Cyclopentano-10:13-dimethyl-polydiphenanthrene containing a lower alkyl substituted quaternary ammonium group, the nitrogen atom of the said quaternary ammonium group being bound to a secondary carbon atom. No. 2,481,524. Ciba Pharmaceutical Products, Inc.

Forming acylcarbamylguanidines. No. 2,481,526. American Cyanamid Co.

Preparing a gelatin derivative containing an amino group which comprises mixing a solution of gelatin with isothiocyanic anhydride at a pH of 9.5-10.5. No. 2,481,540. Eastman Kodak Co.

Separation of acetic acid from molasses by adding calcium hydroxide to produce a pH from 6.0 to 7.0, adding calcium chloride and a magnesium salt selected from the group consisting of magnesium chloride and magnesium sulphate to react and combine with all the free and combined acetic acid. No. 2,481,557. U. S. A. by Secretary of Agriculture.

Manufacture of aliphatic dinitriles in which the nitrile groups are attached to adjacent carbon atoms, by forming a mixture of substantially equimolecular proportions of an alpha-beta-olefin nitrile and liquid hydrogen cyanide together with a cyanide of a metal selected from the group consisting of calcium, aluminum, sodium and alkaline earth metals. No. 2,481,590. Celanese Corp. of America.

In manufacture of mercaptans, the process comprising condensing an aliphatic tertiary olefinic hydrocarbon with hydrogen sulfide in the presence of boron fluoride and hydrogen fluoride. No. 2,481,583. Sharples Chemicals, Inc.

Compound of the formula:  $(\text{C}_6\text{H}_5\text{O})_2\text{CH}\cdot\text{CHO}\cdot\text{CN}$  wherein Q is a radical selected from the class which consists of  $\text{NH}_2$  and  $\text{NH}_2\cdot\text{HCl}$  radicals. No. 2,481,597. Merck & Co., Inc.

Preparing acid acetates by absorbing ketene in a ketone having at least two hydrogen atoms on each carbon atom attached to the carbonyl group, in the presence of an acid condensation catalyst capable of enolizing the ketone and selected from the group consisting of sulfuric, phosphoric, hydrochloric, p-toluenesulfonic, benzenesulfonic, m-benzenedisulfonic, p-xylene sulfonic, p-nitro benzenesulfonic and m-nitrobenzenesulfonic acids. No. 2,481,669. Eastman Kodak Co.

2-amino and 2-alkylthio-4-(2-furyl)-thiazoles. No. 2,481,673. Eastman Kodak Co.

4-(2-pyrryl) thiazoles and 4-(2-pyrryl) selenazoles. No. 2,481,674. Eastman Kodak Co.

Simultaneously preparing a thioether and an anhydro-meso-substituted carboxylic acid by reacting a hydroxy compound containing a cyclohexanum carboxyl quaternary salt with an ester of a dithiocarboxylic acid. No. 2,481,698. Eastman Kodak Co.

Preparation of a theophylline-ethylenediamine compound by reacting a solution of theophylline in a weakly basic amine selected from the group consisting of pyrimidine, epinephrine and caffeine with an aqueous solution of ethylenediamine. No. 2,481,715. Merck & Co., Inc.

In producing a hydrocarbon oil of higher styrene content from an oil containing a lower styrene content, the step which comprises fractionally distilling such oil and 1-nitropropane. No. 2,481,734. Allied Chemical & Dye Corp.

Mono-aryl isomalamines. No. 2,481,758. American Cyanamid Co.

Preparing a  $\gamma$ -hydroxy-oxo aliphatic compound by oxidizing a tetrahydrofuran compound of the class consisting of tetrahydrofuran and alkyl substituted tetrahydrofurans in the presence of a mixture comprising the peroxide of said tetrahydrofuran compound, a  $\gamma$ -hydroxy-oxo aliphatic compound which is the decomposition product of the same peroxide, and unconverted tetrahydrofuran and isolating said  $\gamma$ -hydroxy-oxo aliphatic compound. No. 2,481,761. Les Usines de la (Société Anonyme).

Making an aliphatic nitrile by reacting an olefin with a mixture containing oxygen and ammonia. No. 2,481,826. Allied Chemical & Dye Corp.

Continuous process for extracting aromatic hydrocarbons from hydrocarbon

mixtures which comprises subjecting said mixtures to contact in an extraction zone with an aluminum halide-aromatic hydrocarbon complex containing two aluminum halide and at least one mol of aromatic hydrocarbon. No. 2,481,843. Standard Oil Development Co.

In production of terpene hydrate by the treatment of pinene with dilute sulfuric acid, the step of including in the reaction mixture a quantity of mahogany acids and toluene sulfonic acid. No. 2,481,845. King Organic Chemicals, Inc.

Process for the vapor phase hydrogenation of crude naphthalenes containing sulfur compounds to produce tetrahydronaphthalene and decahydronaphthalenes by passing the crude naphthalenes with hydrogen over a hydrogenation catalyst containing a metal from the group consisting of nickel and cobalt. No. 2,481,921. Allied Chemical & Dye Corp.

Manufacture of cyclohexanol and alkyl substituted cyclohexanol by reacting with hydrogen and water vapor in the presence of a catalyst selected from the class of chromites of metals forming hydrogenating oxides, a compound taken from the group consisting of nitrobenzene and its alkyl substitution products. No. 2,481,922. E. I. du Pont de Nemours & Co.

Parformaldehyde containing, as an agent for controlling and stabilizing polymer reactivity, a substance taken from the group consisting of hydantoin, monomethyl hydantoin, dimethyl hydantoin, and N-methyl derivatives of hydantoin, monomethyl hydantoin, and dimethyl hydantoin. No. 2,481,981. E. I. du Pont de Nemours & Co.

Continuous process for the dimerization of propylene with the production of tetramethyl ethylene, comprising continuously vaporizing propylene, fractionating the vapors, thereafter condensing said propylene vapors, flowing the propylene condensate through a bed of activated clay. No. 2,482,008. Sharples Chemicals, Inc.

Preparation of organic chlorophosphates. No. 2,482,063. American Cyanamid Co.

Acetylating a compound,  $\text{RCO}(\text{CH}_2)_x\text{COR}$  in which R is alkyl and R' is a group selected from alkyl and ethoxy, x being an integer of not more than 2 which comprises reacting thereof with isopropenyl acetate in the presence of an esterification catalyst selected from the group consisting of sulfuric acid, p-toluenesulfonic acid, selenic acid, N-acetyl sulfamic acid, zinc chloride, boron trifluoride etherate, triethylamine, pyridine and benzyl dimethylamine. No. 2,482,066. Eastman Kodak Co.

Preparation of adenine and thioadenine acid by halogenating a member of the class consisting of uric acid and 2-thio uric acid to replace the hydroxyl with halogen, reacting the halogenated compound with a member of the class consisting of ribose and a halogeno acylated ribose, replacing the 6-halogeno with an amino group, thereafter replacing the remaining halogen with hydrogen, and phosphorylating the adenine or thioadenine thus produced. No. 2,482,067. Francis & Rusklin.

Isomerizing isomelamines. No. 2,482,076. American Cyanamid Co.

## Paper and Pulp

In producing cigarette paper which comprises the steps of digesting, chlorinating, bleaching flax pulp, sheeting the pulp on a paper machine and drying the sheet, the improvement of modifying the bleaching treatment so as to produce a flax pulp having a relatively high copper number for any given viscosity comprising introducing into an aqueous suspension of the pulp for the bleaching thereof the reaction product of an hypochlorite with a water soluble salt of a metal selected from the group consisting of cobalt and nickel, said hypochlorite being selected from the group consisting of alkali and alkaline earth hypochlorites. No. 2,480,148. Ecusta Paper Corp.

Paper product for use as a liner for tacky elastomers comprising paper having a base coating consisting essentially of an alkali metal silicate and a finely divided filler and a top coat consisting of a mineral wax binder having dispersed therein preformed discrete particles of a water-insoluble soap. No. 2,480,352. S. D. Warren Co.

## Petroleum

Antiknock composition consisting of a lead antiknock compound and a scavenger, a principal active scavenging ingredient of which is a bromo-hydrocarbon having 2 to 3 bromine atoms and from 3 to 8 carbon atoms, having not more than one bromine atom attached to any carbon atom. No. 2,479,900. Ethyl Corp.

Antiknock composition consisting of a lead antiknock compound and a scavenger, a principal active scavenging ingredient of which is a mono-bromo-alkylbenzene having 8 carbon atoms and having the bromine atom attached to the benzene ring. No. 2,479,901. Ethyl Corp.

Antiknock composition consisting of a lead antiknock compound and a scavenger, the principal active ingredient of which is an aromatic hydrocarbon of the benzene series, containing 6 to 8 carbon atoms, having 2 to 3 chlorine atoms attached directly to the benzene ring. No. 2,479,903. Ethyl Corp.

Stable cracked gasoline comprising cracked gasoline and 3,5,3',5'-tetramethyl-4,4'-dihydrodiphenyl. No. 2,479,948. Shell Development Co.

Regeneration of catalysts used in the production of hydrocarbons from carbon monoxide and hydrogen, deactivated by the deposition thereon of high-boiling waxy material during said synthesis, by periodically reactivating said catalyst by increasing the reaction temperature during the course of said reaction to a point at which the hydrocarbon product formed consists essentially of methane. No. 2,479,999. Phillips Petroleum Co.

In an alkylation operation wherein isobutane is alkylated with an olefin, the steps of treating under non-alkylation conditions a C<sub>6</sub> hydrocarbon fraction containing isopentane and amylene to provide a portion rich in amylene and a portion rich in isopentane and passing the portion rich in amylene free from the portion rich in isopentane to the alkylation operation. No. 2,480,001. Sun Oil Co.

Purifying a naphthene hydrocarbon from a non-aromatic liquid mixture composed of a major amount of said naphthene hydrocarbon and a minor amount of a straight chain paraffin hydrocarbon which comprises filtering the mixture through a body of activated carbon, thereby selectively adsorbing said paraffin hydrocarbon. No. 2,480,242. Sun Oil Co.

Effecting carbon monoxide-hydrogen synthesis by contacting a carbon monoxide-hydrogen mixture under synthesis conditions with an iron type catalyst promoted by iron fluoride. No. 2,480,341. Standard Oil Co.

Mineral oil composition containing oxidation inhibitor. No. 2,480,449. Pure Oil Co.

Cracking hydrocarbon oils for the conversion into a high octane gasoline which comprises contacting the hydrocarbon oil in vapor form at cracking temperature with an emulsion with improved catalytic mass, comprising calcined bauxite supporting tin oxide as a promoter. No. 2,480,494. Phillips Petroleum Co.

Reactivating a deactivated silica-alumina hydrocarbon conversion catalyst, comprising soaking the deactivated catalyst in an aqueous solution containing alkali metal hydroxide, removing the catalyst from the soaking solutions, water-washing the catalyst, directly base exchanging the alkali metal so introduced into said catalyst with an aqueous solution

of an aluminum salt and washing the catalyst free of said salt. No. 2,480,627. Sococo-Vacuum Oil Co., Inc.

Preparing aluminum soap base grease which has a tendency to break down mechanically upon prolonged mechanical working during its transition from rubbery structure to gear structure, comprising heating aluminum soap with mineral lubricating oil at a grease-forming temperature, thereafter cooling to its transition temperature, accompanied by mechanical working, and thereafter mixing solid carbon dioxide into the grease with continued mechanical working to lower the grease temperature rapidly below said transition temperature. No. 2,480,647. Standard Oil Development Co.

Mineral oil composition comprising a viscous mineral oil and a minor proportion, sufficient to stabilize said oil against the deleterious effects of oxidation of a sulfur-containing reaction product obtained by reaction of an oil selected from the group consisting of an animal oil and vegetable oil, with a sulfur-containing by-product tar, the latter being obtained by: separately preheating sulfur and an aliphatic hydrocarbon containing from 4 to 6 carbon atoms. No. 2,480,660. Sococo-Vacuum Oil Co., Inc.

Mineral lubricating oil containing dissolved therein a mixed alkaline earth metal salt of an alkylated phenol sulfide having an alkyl side chain of 4 to 8 carbon atoms attached to each benzene nucleus, the metal selected from the group consisting of barium and strontium. No. 2,480,664. Standard Oil Development Co.

Two-zone fluidized destructive distillation process. No. 2,480,670. Standard Oil Development Co.

Making a mineral oil concentrate containing a dithiophosphoric acid of an alkyl-substituted phenol. No. 2,480,673. Sococo-Vacuum Oil Co., Inc.

Two-stage synthesis of hydrocarbons. No. 2,481,145. Standard Oil Development Co.

Thiaryl mercaptals and mercaptols in lubricating compositions. No. 2,480,831. Sococo-Vacuum Oil Co., Inc.

Thienyl thioethers in lubricating compositions. No. 2,480,832. Sococo-Vacuum Oil Co., Inc.

Lubricating oil composition comprising lubricating oil, the reaction product obtained by reacting, an oil-soluble oxygen-containing organic compound selected from the group consisting of fatty acids and fatty acid esters with a phosphorus sulfide, an oil-soluble detergent selected from the class consisting of organic sulfonates and organic sulfates. No. 2,480,873. Standard Oil Co.

Removing contaminants from cracking catalysts wherein finely divided solid silica-alumina catalyst is intimately contacted with hydrocarbons causing a cracking reaction to cause cracking of hydrocarbons and wherein said catalyst is withdrawn from the cracking zone to catalyst regeneration zone, the steps of contacting the catalyst with a hot combustion supporting gas in the regeneration zone, withdrawing a substantial portion of the catalyst and contacting it with vaporized carbon tetrachloride under anhydrous conditions to remove metallic compounds therefrom. No. 2,481,253. Standard Oil Development Co.

Lubricating composition consisting of a mineral lubricating oil and an oil soluble condensation product, obtained by condensing with said oil a peroxide catalyzed vulcanization of rubbery material and polymer prepared by the polymerization in aqueous emulsion, said polymer being selected from the group which consists of polybutadiene-1,3 and copolymer of butadiene-1,3 with a monomer containing a polymerizable vinyl group, and a primary amine containing a tertiary amine, in 18 carbon atoms per molecule. No. 2,481,257. Standard Oil Development Co.

Removing halogen impurities from hydrocarbons by contacting said hydrocarbons under anhydrous conditions with a catalyst consisting of active carbon in combination with an alkaline compound of a metal of the group consisting of alkali and alkaline earth metals, thereby retaining said halogen impurities in said catalyst and recovering said hydrocarbons free of said halogen impurities. No. 2,481,300. Shell Development Co.

Lubricating composition comprising an oleaginous material and a minor amount, to stabilize said oleaginous material against deterioration and corrosion, of a reaction product obtained by initiating, treating cyclic ketone fractions having at least 12 carbon atoms with phosphorus sulfide and thereafter treating said reaction product with a sulfurizing agent. No. 2,481,487. Shell Development Co.

In refining liquid hydrocarbons by extraction of the mercaptans by washing with a reagent formed by the extraction of hydroxide of an alkaline metal containing solvents therein, the use as said solvent of a salt of an alkali metal from the group consisting of sodium and potassium, of those sulfonic acids which are present in the acid tars forming a by-product of the distillation products of crude petroleum oils. No. 2,481,570. Societe Generale des Huiles de Petrole.

Lubricating oil composition having incorporated therein in an amount sufficient to impart extreme pressure properties to said lubricating oil of a complex reaction product obtained by contacting an organic nitrogen base with an organic monocarboxylic acid and an oxidized mixture of from 1 to 20 moles of an organic sulfonate and a hydrocarbon lubricating body in an amount sufficient to solubilize said organic sulfonate. No. 2,481,585. Michael W. Freeman.

Treatment of a hydrocarbon oil comprising a major portion of aromatics and a minor portion of olefins including the steps of admixing said oil with concentrated sulfuric acid and separating the acid sludge therefrom, subsequently admixing said oil with caustic soda solution and separating said oil from said caustic soda solution, heating, intimately contacting said oil with caustic soda solution and subsequently separating the hot caustic soda solution adding to said separated oil a mixture of an alkali metal salt of petroleum naphthene, distilling said mixture, removing an aromatic concentrate as a side stream from said distillation, and inhibiting said aromatic concentrate. No. 2,481,816. Standard Oil Development Co.

In producing dehydrogenated catalyst pellets from a catalytic material comprising predominantly precipitated alumina and molybdenum oxide, the improvement which comprises mixing graphite with the catalyst material prior to pelleting, calcining the resulting pellets, thus removing volatile constituents but leaving graphite present in the catalyst. No. 2,481,824. California Research Corp.

Preparing a catalyst for catalytic high temperature conversions in which a sub-divided catalyst is suspended in vapors during the catalytic treatment by incorporating into fresh catalyst undergoing preparation prior to its sizing and shaping catalyst withdrawn from a catalytic cracking operation, said withdrawn catalyst having a particle size substantially smaller than said desired size. No. 2,481,841. Standard Oil Development Co.

Diesel fuel consisting of a hydrocarbon fuel which contains tertiary butyl perbenzoate. No. 2,481,859. Standard Oil Development Co.

## Photographic

2-Naphthyl J-acid and the urethanes thereof as color formers. No. 2,480,815. General Aniline & Film Corp.

Photographic emulsions containing *n*-aryloxy, arylthio, and arylseleno-alkyl cyanine dyes. No. 2,481,664. General Aniline & Film Corp.

Polyvinyl alcohol-silver halide photographic emulsion adapted to give coatings resistant to the softening effect of hot rolls comprising silver halide dispersed in a polyvinyl alcohol protective colloid containing a hardener prepared by heating formaldehyde, urea, and polyvinyl alcohol. No. 2,481,676. Eastman Kodak Co.

## Polymers

Low-temperature Friedel-Crafts polymerization of alpha alkyl styrenes in carbon disulfide solution. No. 2,479,618. Atlantic Refining Co.

Sulfonic acid-catalyzed oil-soluble phenol-aldehyde resins. No. 2,479,643. Baskette Corp.

Manufacture of condensation products of a carboxylic acid amide containing at least one hydrogen atom bound to an amide nitrogen atom with an aliphatic bisulfite and a member selected from the group consisting of aliphatic aldehydes containing 3 to 4 carbon atoms and at least one neutralized sulfonic acid group, and unsaturated aliphatic aldehydes which contain 3 to 4 carbon atoms and a C=C-double bond. No. 2,479,782. Ciba Ltd.

Vinyl chloride resins stabilized against discoloration at elevated temperatures, which comprises a polymer of vinyl chloride, said polymer containing intimately dispersed therein from 0.1 to 5% of tetra-alpha-thienyl tin. No. 2,479,918. Monsanto Chemical Co.

Oil-modified solid polyethylenes prepared by alcoholysis of fatty oils selected from the class consisting of drying and semi-drying oils in the presence of (CaOH) and a polyhydric alcohol selected from the class consisting of glycerine, pentaerythritol, polyethylene glycol and mannitol. No. 2,479,951. Monsanto Chemical Co.

Preparing polymeric vinyl fluoride by reacting monomeric vinyl fluoride in the presence of a preformed organic peroxide catalyst and a solvent for both the monomer and the catalyst. No. 2,479,957. General Electric Co.

Treating soluble chlorinated solid polyethylenes which comprises mixing said chlorinated polyethene with an iron salt soluble in organic solvents until at least 55% of said chlorinated polyethene is insoluble in boiling trichloroethylene. No. 2,480,007. E. I. du Pont de Nemours & Co.

Chlorinated solid polyethylenes which are adapted to be converted upon heating to a form having reduced solubility and fusibility, said composition essentially comprising soluble chlorinated solid polyethene and an oxide of lead and a peroxy compound from the group consisting of aromatic per acids, their esters, and aromatic peroxides. No. 2,480,008. E. I. du Pont de Nemours & Co.

Chlorinated solid ethylene polymer containing 20% to 35% by weight of chlorine; and a thermal carbon black. No. 2,480,009. E. I. du Pont de Nemours & Co.

Composition comprising a polymer of the group consisting of solid polyethene and halogenated solid polyethene, and, as a modifier a condensation product of phosphorus pentasulfide and a compound of the group consisting of primary and secondary alcohols, amines, and mercaptans having a straight chain, saturated aliphatic radical of 10 to 24 carbon atoms, inclusive. No. 2,480,296. E. I. du Pont de Nemours & Co.

Solid polyethene having a sulfide of phosphorus uniformly distributed therein. No. 2,480,297. E. I. du Pont de Nemours & Co.

Ester comprising a polyhydroxy condensation product resulting from the condensation of formaldehyde and methyl ethyl ketone, said condensation product being substantially completely esterified with an unsaturated higher fatty acid. No. 2,480,347. General Mills, Inc.

Intermediate reaction product of ingredients comprising formaldehyde and a compound formed by the reaction of dicyandiamide with a hydrazide having not more than two hydrazide radicals in the molecule, capable of conversion into an infusible resin. No. 2,480,514. Libbey-Owens-Ford Glass Co.

Hydrolyzed interpolymer of ethylene, vinyl acetate, and diethyl fumarate. No. 2,480,551. E. I. du Pont de Nemours & Co.

Pyrolyzing polyfluoroalkanes consisting of the elements carbon, hydrogen, and fluorine, from 2 to 5 carbon atoms, at least 2 fluorine atoms on at least one carbon atom and at least one hydrogen on an adjacent carbon atom, all carbons carrying a single fluorine atom being adjacent a carbon carrying at least 2 fluorine atoms. No. 2,480,560. Kinetic Chemicals, Inc.

Ternary interpolymers of vinylidene chloride, alpha-methyl styrene and acrylonitrile. No. 2,480,680. Dow Chemical Co.

Composition comprising polyvinyl alcohol and the product formed by the reaction of diethanolamine and hydrochloric acid. No. 2,480,766. Resistoflex Corp.

Interpolymers of acrylamides and allyl aceto-acetates. No. 2,480,810. General Aniline & Film Corp.

Distributing a water-dispersible material uniformly throughout a water-insoluble thermoplastic polymer, which comprises dispersing said water-dispersible material in water in the presence of a dispersing agent, mixing the resulting aqueous dispersion with said thermoplastic polymer and then masticating until said mixture is colloided. No. 2,480,821. E. I. du Pont de Nemours & Co.

Organosubstituted silicon polymers. No. 2,480,822. Corning Glass Works.

Electrolytic removal of resin from metal. No. 2,480,845. Max Frager and Hyman Iserson.

Controlling polymerization of polyhydric alcohol esters of alpha-olefinic dicarboxylic acids with ethylenic monomers. No. 2,480,923. U. S. Rubber Co.

Preparation of insoluble cation-exchange resins by condensing by heating a phenol from the class consisting of hydroxybenzene, *m*-cresol, 3,5-dimethylphenol, and resorcinol with phthalic anhydride in the presence of sulfuric acid, neutralizing with a strong base, then condensing in aqueous solution under the influence of heat formaldehyde and said neutralized reaction product, continuing the condensation until a gel is formed, drying and heating said gel until it is converted into a porous mass of insoluble, infusible resin, washing said resin with dilute mineral acid, and converting said resin into the hydrogen form. No. 2,480,970. Rohm & Haas Co.

Polymerization of organo-siloxanes with a diacyl peroxide. No. 2,481,052. Corning Glass Works.

Stabilization of polyvinyl chloride compositions with a dibutyl dialkoxo compound of a metal of group IV B of the Periodic Table according to Mendeleev. No. 2,481,086. Dufflers Co., Ltd.

Thermosetting resin molding composition which comprises contacting substantially chemically-neutral, oil-free, disintegrated wood with formaldehyde and ethylene dichloride, and subsequently contacting with a solution of urea. No. 2,481,136. Paterson Plastics Co.

Sulfurized low molecular weight linear polymer of 2-methyl-1,3-pentadiene and 4-methoxy-1,3-pentadiene. No. 2,481,140. Shell Development Co.

Resinous material obtained by reaction between an aldehyde and a thermoplastic composition resulting from a transesterification reaction between at least one triazine derivative and a dihydric alcohol. No. 2,481,155. American Cyanamid Co.

Reaction products of a polyhydric alcohol and a triazine derivative. No. 2,481,156. American Cyanamid Co.

Making a highly chlorinated polyethylene by preparing a dispersion of polyethylene in a dispersion medium in which the highly chlorinated polyethylene is soluble, passing chlorine gas through the dispersion in the presence of catalytic light. No. 2,481,188. Pierce Laboratory, Inc.

Preparation of catalysts for use in hydrocarbon synthesis operation by precipitating a metal from the group consisting of iron, cobalt or nickel from its aqueous salt solution upon sub-divided aluminum. No. 2,481,238. Standard Oil Development Co.

Interpolymerizing an isocoulen having 4 to 7 carbon atoms with a diolefin having 4 to 14 carbon atoms comprising mixing the olefins, cooling, and polymerizing the cold mixture by the addition of a hydrocarbon solution of a double salt composed of a Friedel-Crafts active metal halide and a Friedel-Crafts active metal oxy halide. No. 2,481,273. Standard Oil Development Co.

Solutions of acetone-insoluble polyvinyl-chloride in a mixture of carbon disulfide and acetone. No. 2,481,294. Societe Rhodienne.

Heat and light stabilized plastic composition containing polyvinyl chloride and normal barium octylsulfate. No. 2,481,307. Shell Development Co.

Organic resinous silicon polymer obtained by polymerizing at least one silol having the monomeric formula  $(R)Si(OR')_2(OH)_2$ , wherein R is an organic hydrocarbon radical selected from the group consisting of alkyl and aryl radicals, R' is a residual aliphatic grouping of an unsaturated aliphatic monohydroxy alcohol having terminal CH=CH groups, and R and R' are integers within the limits of 1 and 2, and n is an integer less than 4 and more than 1. No. 2,481,349. Carborundum Co.

Hydrolyzing polyvinyl acetate by dissolving guanidine carbonate in methanol, adding hydrogen dioxide to inactivate the guanidine carbonate, then dissolving polyvinyl acetate in the solution and heating. No. 2,481,388. E. I. du Pont de Nemours & Co.

In stabilization of polysulfone resins formed by reacting an unsaturated olefinic hydrocarbon containing 3 to 4 carbon atoms with sulfur dioxide whereby said resins are rendered highly resistant to thermal decomposition, the step which comprises incorporating an organic compound containing at least one sulphydryl group. No. 2,481,596. Celanese Corp. of America.

Preparing a resinous ester by heating the heteropolymer of isopropenyl acetate and maleic anhydride with normal hexyl alcohol, in the presence of sulphuric acid. No. 2,481,769. Eastman Kodak Co.

Composition of matter comprising an aqueous mixture of dispersed polymerized chloroprene and dissolved partially condensed resorcinol-formaldehyde resin, also containing free alkali metal hydroxide as a catalyst for completion of the resin-forming reaction. No. 2,481,879. U. S. Rubber Co.

Producing a vinyl chloride-containing polymer having a high stability against thermal decomposition by adding to an aqueous dispersion of a vinyl chloride-containing polymer taken from the group consisting of polyvinyl chloride, vinyl chloride-fumaric ester copolymers, vinyl chloride-vinyl acetate copolymers, vinyl chloride-vinylidene chloride copolymers, vinyl chloride-acrylonitrile copolymers, vinyl chloride-acrylic ester copolymers, and vinyl chloride-methacrylic ester copolymers, a compound taken from the group consisting of sodium pyrophosphate and sodium hexametaphosphate, and coagulating said polymer by addition of a water-soluble metal salt. No. 2,482,038. E. I. du Pont de Nemours & Co.

Vinyl chloride-containing polymers having a high stability against thermal decomposition by adding a water-soluble metal salt which will not form an insoluble salt with acid present to said polymers, and washing said coagulated polymer. No. 2,482,048. E. I. du Pont de Nemours & Co.

Forming and fractionating polymeric materials which comprises polymerizing an ethylenically unsaturated monomer in a normally liquid selective solvent to form a mixture of polymers having different solubilities in said solvent, selectively precipitating polymers of lower solubility in said selective solvent, separating, passing said selective solvent polymer solution to a second solvent zone, precipitating a second polymer fraction, separating said second polymer fraction, and repeating the ethylenically unsaturated monomer in the selective solvent. No. 2,482,056. California Research Corp.

Separator for storage batteries consisting of a compressed coherent microporous polyethylene of substantially parallel polystyrene fibers. No. 2,482,062. Dow Chemical Co.

Vinylidene chloride-butadiene-acrylonitrile interpolymers. No. 2,482,073. Dow Chemical Co.

## Processes & Methods

Method of producing a stable foam generating composition which comprises hydrolyzing proteinous material selected from the class consisting of keratins, albumens, globulins, hemoglobins, and seed meal proteins, adding thereto a foam stabilizing soluble ferrous salt capable of reacting with some of the hydrolysate at elevated temperatures to form an insoluble precipitate. No. 2,481,875. Pyrene Co., Ltd.

## Rubber

Synthetic rubber, selected from the group consisting of butadiene-acrylonitrile polymers and butadiene-styrene polymers, and an incompletely hydrochlorinated polybutadiene, and a para-phenylene hydrocarbon containing 6 to 27 carbon atoms to the molecule, containing 10% to 36% of chlorine. No. 2,479,671. S. J. Cohen and W. E. Scheer.

Improving carbon black for compounding with rubber by oxidizing impingent carbon black for two hours while air is added to the carbon black under treatment and thereby increasing its volatile content, and then devolatilizing the same carbon black by heating at 1200° F. for about one half hour while air is excluded therefrom. No. 2,479,708. Godfrey Cabot Inc.

Synthetic rubber composition containing a butadiene-styrene co-polymer, a semi-reinforcing furnace black, and sulfurized tall oil of sticky viscous consistency. No. 2,480,478. Pierce Laboratory, Inc.

Producing organosiloxane elastomers by vulcanizing an extrudable compounded siloxane which is composed of a readily deformable organopolysiloxane which has a degree of substitution between 1.75 and 2.25 monovalent hydrocarbon radicals per silicon atom, a filler and a vulcanizing agent, by heating in direct contact with saturated steam. No. 2,480,620. Corning Glass Works.

Vulcanizing of rubber with urea-metal salt complex accelerators. No. 2,480,814. J. M. Huber Corp.

Preparing readily processable polychloroprene by polymerization of 2-chlorobutadiene-1,3 in an aqueous emulsion and in the presence of an aromatic iodide. No. 2,481,044. E. I. du Pont de Nemours & Co.

Improving cut growth resistance of butadiene-vinyl pyridine rubbery copolymers by curing in the presence of an aromatic sulfonic acid. No. 2,481,810. U. S. Rubber Co.

Improving cut grating resistance of butadiene-vinyl pyridine rubbery copolymers by curing in the presence of a halogenated lower fatty acid. No. 2,481,811. U. S. Rubber Co.

Improvement of synthetic rubber latex by the emulsion polymerization with a soap emulsifying agent of polymerizable monomers selected from the group consisting of butadienes-1,3 and mixtures of butadienes-1,3 with compounds which contain a single vinyl group and carrying out the polymerization in the presence of acylated casein. No. 2,481,838. U. S. Rubber Co.

Production of synthetic rubber latices having large average particle size by lowering the temperature without freezing of a synthetic rubber latex comprising an aqueous emulsion polymerizate of polymerizable material selected from the group consisting of butadienes-1,3, isoprene, chloroprene, piperylene and 2,3-dimethyl butadiene-1,3 and mixtures of such butadienes-1,3 with up to 70% of the mixture of other polymerizable compounds which contain a single vinyl group and containing sodium carylate and alkali soap of higher fatty acids containing at least 10 carbon atoms. No. 2,481,876. U. S. Rubber Co.

## Specialties

Alkali-organic solvent paint remover consisting of sodium metasilicate, pentahydrate, sodium carbonate, sodium bicarbonate, sodium thiosulfate, pentahydrate,  $C_{12}$ -alkyl sulfonate wetting agent, and ethylene glycol monobutyl ether. No. 2,479,628. Wyandotte Chemicals Corp.

Alkali-organic solvent type paint remover consisting of water, a mixture of sodium metasilicate, sodium carbonate and sodium bicarbonate, a metal xylene sulfonate, and ethylene glycol monobutyl ether. No. 2,479,629. Wyandotte Chemicals Corp.

Protecting metallic surfaces against atmospheric corrosion for a limited time by applying a film of a non-drying composition comprising clay tower polymers produced in the clay treatment of cracked gasoline, petroleum, mineral lubricating oil, and a volatile aliphatic essentially paraffinic hydrocarbon liquid thinner; allowing said thinner to evaporate leaving a tenaciously clinging paraffinic hydrocarbon soluble substantially unoxidized film. No. 2,479,762. Phillips Petroleum Co.

Welding flux comprising sodium carbonate monohydrate, a hydrated alkali metal perchlorate and graphite. No. 2,479,798. Rene D. Wasserman.

Stabilization of printing pastes containing diazonium salts with a water soluble acid amide having not more than 15 carbon atoms and having only a single amide group attached to the acyl group, at least one hydrogen of the amide group being replaced with an aliphatic radical included in the group consisting of aliphatic radicals having an olefinic double bond and aliphatic radicals containing an acetylenic triple bond, the acid amide being free from groups capable of azoic coupling or of reaction with nitrous acid and free from metal compounds capable of decomposing diazo compounds at room temperature. No. 2,479,890. American Cyanamid Co.

Protecting cellulose textile materials against the attack of the organisms of rot and mold which includes the steps of (1) successively wetting the textile fibers and surfaces with aqueous solutions of an alkali metal salt of 3-phenyl-salicylic acid and of an inorganic salt of copper, and (2) drying the textile. No. 2,480,084. Dow Chemical Co.

Adhesive composition composed of polythene, ammonium sulfamate, and chlorinated paraffin. No. 2,480,295. E. I. du Pont de Nemours & Co.

Composition matter comprising solid polythene, antimony trioxide, and a solid chlorinated hydrocarbon. No. 2,480,298. E. I. du Pont de Nemours & Co.

Light colored metal fabricating composition consisting of a light colored mineral base lubricating oil containing a concentrate obtained by combining light mineral oil with sulfur, a  $C_1$  to  $C_8$  alkyl ester of abietic acid, and a metal sulfonate, heated until the sulfur is substantially completely reacted with the ester. No. 2,480,666. Standard Oil Development Co.

Producing an adsorbent cleaning material, by forming a mixture of cellulose material selected from the group consisting of sawdust, wood fiber, and paper pulp, and fuller's earth. No. 2,480,753. Attapulguis Clay Co.

Fireproofing composition consisting of a mixture of chlorinated wax and chlorinated naphthalene together with a fireproofing ingredient effective to inhibit the corrosive action of the chlorinated substances, said fireproofing ingredient being an organic phosphate chosen from the group consisting of  $(C_6H_5)_3PO_4H$ ,  $(CH_3)_3PO_4$ ,  $(C_2H_5)_3PO_4H$ ,  $(C_2H_5)_2P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  $(nPrO)_3P(O)H$ ,  $(nPrO)_2P(O)H$ ,  $(nPrO)P(O)H$ ,  $(iBuO)_3P(O)H$ ,  $(iBuO)_2P(O)H$ ,  $(iBuO)P(O)H$ ,  $(nBuO)_3P(O)H$ ,  $(nBuO)_2P(O)H$ ,  $(nBuO)P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  $(nPrO)_3P(O)H$ ,  $(nPrO)_2P(O)H$ ,  $(nPrO)P(O)H$ ,  $(iBuO)_3P(O)H$ ,  $(iBuO)_2P(O)H$ ,  $(iBuO)P(O)H$ ,  $(nBuO)_3P(O)H$ ,  $(nBuO)_2P(O)H$ ,  $(nBuO)P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  $(nPrO)_3P(O)H$ ,  $(nPrO)_2P(O)H$ ,  $(nPrO)P(O)H$ ,  $(iBuO)_3P(O)H$ ,  $(iBuO)_2P(O)H$ ,  $(iBuO)P(O)H$ ,  $(nBuO)_3P(O)H$ ,  $(nBuO)_2P(O)H$ ,  $(nBuO)P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  $(nPrO)_3P(O)H$ ,  $(nPrO)_2P(O)H$ ,  $(nPrO)P(O)H$ ,  $(iBuO)_3P(O)H$ ,  $(iBuO)_2P(O)H$ ,  $(iBuO)P(O)H$ ,  $(nBuO)_3P(O)H$ ,  $(nBuO)_2P(O)H$ ,  $(nBuO)P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  $(nPrO)_3P(O)H$ ,  $(nPrO)_2P(O)H$ ,  $(nPrO)P(O)H$ ,  $(iBuO)_3P(O)H$ ,  $(iBuO)_2P(O)H$ ,  $(iBuO)P(O)H$ ,  $(nBuO)_3P(O)H$ ,  $(nBuO)_2P(O)H$ ,  $(nBuO)P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  $(nPrO)_3P(O)H$ ,  $(nPrO)_2P(O)H$ ,  $(nPrO)P(O)H$ ,  $(iBuO)_3P(O)H$ ,  $(iBuO)_2P(O)H$ ,  $(iBuO)P(O)H$ ,  $(nBuO)_3P(O)H$ ,  $(nBuO)_2P(O)H$ ,  $(nBuO)P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  $(nPrO)_3P(O)H$ ,  $(nPrO)_2P(O)H$ ,  $(nPrO)P(O)H$ ,  $(iBuO)_3P(O)H$ ,  $(iBuO)_2P(O)H$ ,  $(iBuO)P(O)H$ ,  $(nBuO)_3P(O)H$ ,  $(nBuO)_2P(O)H$ ,  $(nBuO)P(O)H$ ,  $(iPrO)_3P(O)H$ ,  $(iPrO)_2P(O)H$ ,  $(iPrO)P(O)H$ ,  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# Trade marks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

**GRANCO.** Graphite lubricant. 487,618. Granberg Equipment, Inc.  
7699. Gasoline. 491,899. Union Oil Co. of Calif.

**CONQUEST.** Anti-freeze fluid. 504,276. Industrial Oil Corp.  
**THORANE.** Lubricating oil. 507,967. Chemical Corp. of America.

**SPRA-KLEEN.** Liquid alkaline concentrate for use as an all-purpose detergent and control in water curtains for paint spray booths. 508,478. Harco Chemical Co.

**CAL SHEEN.** Ready-mixed paint for walls and ceilings. 511,672. Carberry Chemical Co.  
**Shirley White.** Shoe polish for all white shoes. 515,485. Shirley White Polish Co.

**METAL-CLEAN.** Liquid solvents for cleaning objects of metal. 516,098. Metal-Clean Solvent Corp.

**Reliable.** Trustworthy as its Name. Motor lubricating oil. 516,108. Atlas Lubricant Corp.  
**HYPER-SCALD.** Chemical wetting agent for use in poultry scalding baths. 516,111. Gordon Johnson Co.

**KILBUG.** Insecticides. 516,123. West Disinfecting Co.

**GROVE TESTED.** Fertilizers composed of phosphate, potash, magnesium and other organics. 516,130. Dr. F. Phillips Fertilizers, Inc.

**THE PRODUCT WITH A PEDIGREE.** Dry, paste, and ready-mixed paints; varnishes; and lacquers. 516,638. P. D. George Co.

**SILVERSHIR.** Paints in paste or semi-paste form. 516,641. Sedlitz Paint & Varnish Co.

**MOTOR-X.** Paint enamel. 516,651. Alston-Lucas Paint Co.

**LAMBERT GREEN.** Ready mixed oil paints. 516,667. Lambert Landscape Co.

**SHERWIN-WILLIAMS.** Lensed zinc, zinc oxide, lithopone, litharge, red lead, white lead, silicates, synthetic resins, vegetable oils and dry colors. 524,728. Sherwin-Williams Co.

**FLEXOPRENE.** Emulsified composition for coating cloth to make a product resembling oilcloth. 526,563. Interchemical Corp.

**PUROTEX.** Technical non U.S.P. white oil and lubricating oils. 526,824. Pure Oil Co.  
**Syntho-auds.** Detergent. 527,418. Frontier Products Co.

**TANOYL.** Sulfonated oils. 529,812. Nopco Chemical Co.

**+D-** Synthetic resinous ion exchange materials. 531,017. Chemical Process Co.

**HARLEY-DAVIDSON.** Synthetic enamels, varnish, and liquid polish and cleaner for use on motorcycles. 531,114. Harley-Davidson Motor Co.

(Symbol). Ceramic overglaze colors; ceramic engobes colors; ceramic underglaze colors; colored glass ceramic glaziers, including majolica; low fired ceramic glazes; satin finish ceramic glazes; and matt finish ceramic glazes. 531,328. Fennco Corp.

**Powered GRE-SOLVENT.** Detergent. 534,480. Utility Co., Inc.

**PURE AS GOLD.** Automobile lubricating oils and cup grease. 534,668. Pep Boys, Manny, Mo & Jack.

**PURE AS GOLD.** Automobile lubricating oils and cup grease. 534,669. Pep Boys, Manny, Mo & Jack.

**SPED-KUT.** Cutting oils. 534,682. D. A. Stuart Oil Co., Ltd.

**THERMEX.** Lubricating oils and quenching oils. 534,683. D. A. Stuart Oil Co., Ltd.

**JENNEY.** Petroleum products. 535,535. Jenney Mfg. Co.

The Quakers of Conshohocken Pa. U. S. A. Lubricating oils and greases; cutting oils; oils for lubricating needles and sinkers on knitting machines; rubber, petroleum oils and greases. 535,876. Quaker Chemical Prods. Corp.

**RENUZIT.** Motor lubricating oil. 537,508. Remuit Home Products Co.

**FRANKLIN GLUE.** Liquid hide glue. 538,390. Franklin Glue Co.

**Youth.** Scouring cleanser. 539,196. Murphy-Brook Grocery Co.

**BLACK DOT.** Paint in liquid and paste form. 539,275. Continental Paint & Varnish Co.

**BAKER & ADAMSON.** Reagent chemicals. 539,305. Allied Chemical & Dye Corp.

**TAVEN.** Ready mixed house paint. 539,787. Stetson Paint & Varnish Co.

**X-TRON.** Synthetic resins for removal of negative ions from aqueous solutions and organic solvent solutions by base exchange action. 540,195. Monsanto Chemical Co.

**Vitame.** Gasoline. 541,607. Thompson Products, Inc.

**Phillips 66.** Gasoline, lubricating motor oils, grease compounds, etc. 542,162. Phillips Petroleum Co.

(Symbol). Gasoline, lubricating motor oils, grease compounds, kerosene, tractor fuel oil,

drileps penetrating oil, and top cylinder lubricating oil. 542,164. Phillips Petroleum Co.

**KANOTEX.** Gasoline, naphtha, kerosene, oil tractor fuel, and distillate burning fuel. 542,951. Kanotex Refining Co.

**TURP-O-LENE.** Thinner for paint, enamels, varnishes, diler, and stains. 543,134. Elmore Paint Co.

**PENNSALT HF.** Self-hardening organic resin composition. 543,214. Pennsylvania Salt Mfg. Co.

**ARAMA.** Petroleum and mineral waxes. 544,022. Allied Raw Materials Co., Inc.

**G. N. S. PINE OIL NO. 3.** Steam-distilled pine oil, used in the flotation process of mineral separation. 544,102. Newport Industries, Inc.

**G. N. S. PINE TAR OIL NO. 3.** Pine tar oil used in flotation process of mineral separation. 544,103. Newport Industries, Inc.

**POMONA.** Gasoline. 545,071. Charles Allen Beck.

**FAMOUS FREDERICK COUNTY LIME.** Lime. 546,151. M. J. Grove Lime Co. of Frederick County.

**LAMBRAND.** Sulphur. 546,692. Food Machinery & Chemical Corp.

**GRIFFIN.** Liquid preparation for dyeing shoes. 547,335. Griffin Mfg. Co., Inc.

**CAMBRIDGE.** Artists' oil and water colors, and artists' varnishes and mediums. 547,537. E. H. & A. C. Friedrichs Co.

**OPTIMUS.** Alkaline, acidic, neutral, and solvent cleaning preparations for industrial cleaning of metals, plastics, and other solid surfaces, and for household cleaning purposes. 548,362. Hanson-Van Winkle-Munning Co.

**OKAKITE.** Cleaning preparations. 548,675. Oakite Products, Inc.

**FULLUSTRE.** Floor polish. 548,948. Fuller Brush Co.

**Spray-Foamatic.** Radiator flushing compound. 549,385. Griffin Mfg. Co., Inc.

**SPRAY-FOAMATIC.** Cleaning compound. 549,387. Moto-Sway Corp. of America.

**PURE PREMIUM.** Gasoline and other motor fuel oils. 549,664. Pure Oil Co.

**YORKSHIRE.** Paris white. 550,806. Ham-mill & Gillespie, Inc.

**AQUATONE.** 551,149. Creative Chemical Co.

**ENERGEE DIESEL.** Diesel fuel oils. 551,198. Pure Oil Co.

**SALINE.** Lubricating oils. 551,327. Sinclair Refining Co.

**SINCLAIR REFINING CO.** Refined, semi-refined, and unrefined oils made from petroleum, both with and without admixture of animal, vegetable, or mineral oils. 551,328. Sinclair Refining Co.

**KUTWELL.** Cutting oils, soluble cutting oils. 551,549. Esso Standard Oil Co.

(Symbol). Hydrated lime, hydrated dolomite, and phosphatic fertilizers. 551,583. Permanente Metals Corp.

**SUPER-GERMITE.** Chemical preparation for uses as a larval spray, antiseptic, disinfectant, germicide, and deodorant. 552,015. Standard Oil Co. of Calif.

**Virdans.** Fertilizer for house plants. 552,290. Virdans Farms.

**AVON.** Petroleum products. 552,371. Tide Water Associated Oil Co.

**SPARKLE-TYPE.** Cleaner for typewriter type. 552,452. William L. Gould.

**Aquanox.** Demulsifying compositions, for use in breaking or resolving petroleum oil-water emulsions. 552,929. Aquanox Corp.

**STA-VIS FLIGHT TESTED.** Lubricating oils and greases and emulsified oil for use with additions of water in coating concrete forms. 553,442. Sta-Vis Oil Co.

**ALITUM.** Petroleum wax. 553,543. F. W. Steadman Co.

**CERATRUM.** Highly refined petroleum wax. 553,544. F. W. Steadman Co.

**3-IN-ONE.** Chemical fertilizer. 553,571. Boyle-Midway, Inc.

**VALENTINE.** Paint enamel. 553,654. Valentine & Co., Inc.

**NULON.** Dry, paste, and ready-mixed paints, paint enamels, paint thinners, and varnishes. 554,581. Marvelite Paint Co., Inc.

**LINSPEED.** Fast kettling pure lined varnish oil. 555,164. Dordard & Sons Co.

**Wood-Var.** Varnish, varnish stain, pigmented material in the nature of paint for filling pores in wood surfaces, varnish undercoats. 555,284. Martin-Senour Co.

**RENEK.** Synthetic detergent. 555,480. Atlas Powder Co.

**JEWEL T.** Bowl cleaner, steel wool pads, soaps, and shoe white. 555,529. Jewel Tea Co., Inc.

**TYCOL ACADAM.** Lubricating oil. 555,850. Tide Water Associated Oil Co.

**SILENITE.** Dry compounds exhibiting char-

acteristics whereof the static and dynamic coefficients of friction are in balance to the extent of eliminating spasmodic actions, vibrations, and noises when employed between frictionally opposed members. 556,300. John Warren Watson Co.

**Lucas.** Paints; paint enamels; lacquers; varnishes; thinners and reducers for paints, varnishes, paint enamels, and lacquers; paint and varnish removers; primers and undercoats; colors in oil; japans; wood fillers; calcamines; cold water paints. 557,290. Lucas Kil-Tone Co.

**Lino-weld.** Adhesive for laying linoleum. 558,050. Paraffine Companies, Inc.

**TRIG.** Wax emulsion for waterproofing fabrics. 558,766. Lancaster Processes, Inc.

**RACET.** Chemical dehydrating agent. 558,810. Aracet, Inc.

**UNIQUE.** Gasoline and lubricating oils. 558,977. Phillips Petroleum Co.

**JUVLTON MOTORS HORMONE HORMONE-LIZE WITH JUVLTON.** Chemical liquid preparation for increasing the efficiency of operation of internal combustion engines. 559,176. Juvlton Motors Hormone.

**KARGLAMOR.** Protective coating composition and polish for automobile bodies. 559,518. Kar Glamor, Inc.

**HAMIKUT.** Reddish amber liquid of oleaginous nature for lubrication and conveying heat in the operation of metal cutting, drilling. 560,105. Haas-Miller Corp.

**ADVAVET.** Detergents and scouring agents. 560,433. Advance Solvents & Chemical Corp.

**BRUX.** Preparation for cleaning paint brushes. 561,558. E. Z. Painter Corp.

**CESCO.** Scouring powders. 561,654. Central Soap Co.

**UNISIZE.** Textile sizing composition. 561,680. Nopco Chemical Co.

**RAMCO.** Agricultural minerals. 561,682. Randall Mills Corp.

**RAMCO.** Agricultural minerals. 561,683. Randall Mills Corp.

**KALITE.** Precipitated calcium carbonate. 561,898. Diamond Alkali Co.

**Golden Key.** Liquid polishing wax for use on wood, linoleum, terrazzo, rubber, and composition floors and painted surfaces. 562,360. Great American Tea Co.

**THFA.** Tetrahydrofurfuryl alcohol. 562,403. Quaker Oats Co.

**INSTANT ELECTRIC.** Liquid starch for laundering. 563,479. Elieberg Co.

**COPEENBLAK.** Carbon black dispersed in polyethylene. 563,655. Binney & Smith Co. Oxford. Metal polish. 564,035. - Crowell Chemical Co.

**WOOLSEY'S BEST.** Copper paint. 564,496. C. A. Woolley Paint & Color Co., Inc.

**LITHOGEN.** Paint or facing for wood, metal, masonry, and composition board surfaces. 564,907. Schreyer & Michaels.

**TORNADO.** Liquid and paste wax. 565,038. Breuer Electric Mfg. Co.

**INETO.** Hair dyes. 565,458. Sales Af-filiates, Inc.

**Ku-Glu.** Glue. 565,609. Brunswick-Balke-Coller Co.

**SEE-JAY.** Insect exterminating powder. 565,950. See-Jay Exterminating Service, Inc.

**MIRROR-TONE.** Anti-freeze. 566,181. Spalding Brothers, Inc.

**VIRGINIA RED.** Pigments for use in the manufacture of printing ink. 566,366. Standard Ultramarine Co.

**etc.** Chemical drain opener. 566,618. Judson Dunaway Corp.

**BLIZZARD.** Liquid anti-freeze preparations. 566,661. George Senn, Inc.

**BUTOX.** Spray type liquid insecticide. 566,830. Nash & Kinsella Labs., Inc.

**TOXERONE.** Spray type liquid insecticide. 566,831. Nash & Kinsella Labs., Inc.

**Arrowhead.** Waterproof, liquid, general purpose adhesive cements. 567,061. Webb Products Co.

**THORO.** Dry cleaning fluid. 567,159. Thoro Products Co.

**STAYLASTIC.** Paint, in paste, semi-paste, and liquid form. 567,632. Gilman Paint & Varnish Co.

**Gebauer's.** Ethyl chloride, phenyl mercuric chloride and tannic acid. 567,692. Gebauer Chemical Co.

**N-M-P.** Newspaper printing ink. 567,787. J. M. Huber Corp.

**STAFF.** Soap. 568,098. Colgate-Palmolive-Peet Co.

**DUO.** Liquid adhesive. 568,625. Johnson & Johnson.

**J. & J. Soap.** 568,627. Johnson & Johnson.

**LAWSPAR.** Varnishes. 568,771. C. A. Woolsey Paint & Color Co., Inc.

**POLENE.** Vehicle or varnish for printers' inks. 568,832. Western Labs., Inc.

**HOUGHTON SOLV.** Fuel oil sludge dispersing chemical agent. 569,968. E. F. Houghton & Co.

**NYO.** Medicinal and industrial chemicals. 569,464. New York Quinine & Chemical Works, Inc.

**CANNED PLUMBER.** Chemical for clearing and cleaning stopped-up drain and sewer pipes. 569,476. Puritan Chemical Co.

**PARACIL.** Synthetic rubber and rubber-like materials. 571,714. Esso Standard Oil Co.

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For metal polishes

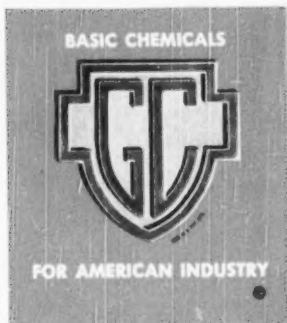


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chemicals and plastics



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